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THE STORY OF A REVOLT

THE CASE FOR MANCHOUKUO

THE PROBLEMS OF THE DAY—
AND THEIR SOLUTION

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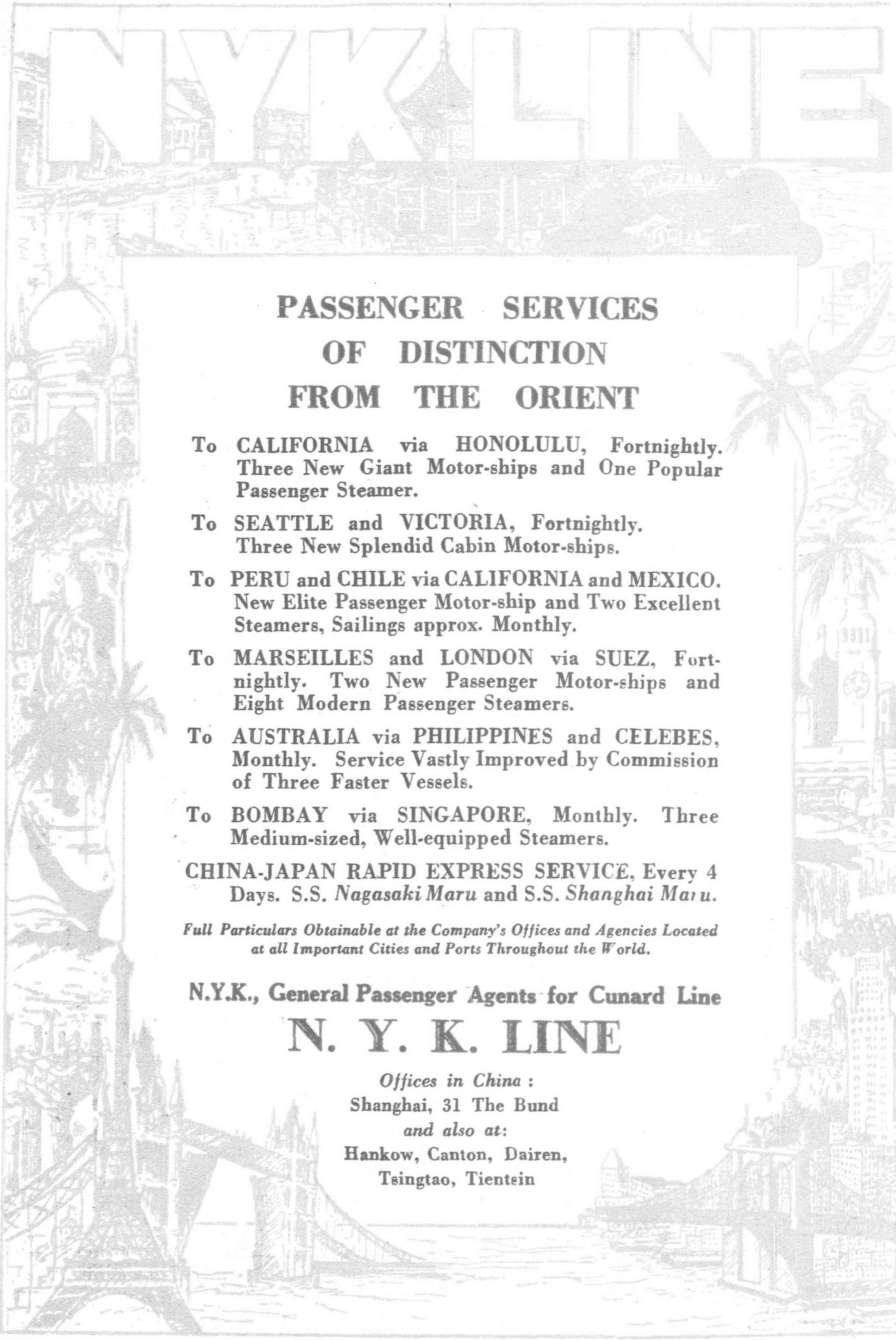

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The Story of A Revolt

By GEORGE BRONSON REA

WERE the people of Manchoukuo justified in taking advantage of the situation created by Japan's resort to self-defense to declare their independence of China Proper ? If we accept the conclusion of the Commission of Enquiry that ninety-seven per cent of the people are **Chinese,** it is easy to understand how its Members were led to believe that the new State does not meet with the wishes of its people. When it can be proven that the overwhelming majority of the people are "**Manchu,**" sons of the soil, the conclusion of the Commission and its suggestions for a settlement based thereon, must be revised.

Once it is shown that the population of Manchoukuo is not overwhelmingly Chinese, the alleged ties of nationalism which bind these people to China Proper disappears and their right to self-determination becomes stronger and more appealing than the arguments advanced to justify the independence of those post-war European States whose Delegates sat in judgment on the people of Manchoukuo. Starting with this categorical assertion of nationality, it is superfluous to restate the wrongs of these peoples by any lengthy exposition of the methods whereby they were reduced to slavery under the operation of a monetary system which transferred their hard earned and paltry wages into the pockets of their despoilers. Their case has been ably, courageously and tersely set forth by the Currency Expert of the League Commission, who says :

> " The author is unacquainted with any instances in recent times where a Government has so ruthlessly, systematically and over so long a period of time, exploited and taxed its own peoples in such a disgraceful manner as have the former Manchurian officials, with the partial exception of those in Liaoning most recently. This disgrace was all the greater because the burden was imposed on those least able to bear it and because practically nothing was given in return for what was taken. In short, **it was nothing but monstrous official robbery, the extent and effects of which it is difficult to appreciate.**"
>
> " Apart from the above-mentioned redeeming aspects, the Chinese currency situation prevailing in Manchuria on September 18, 1931, was appallingly bad, and stands as irrefutable testimony that the Chinese authorities were guilty of a most heinous offence against the millions of poor struggling humanity over whom they exercised jurisdiction."
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> (Extracts from Study No. 5. " The Currencies of the North-eastern Provinces," published in the Supplementary Documents to the Report of the League Commission of Enquiry.)

Historical Parallels

The League Commission of Enquiry concludes that the creation of Manchoukuo could not have been effected without the presence of Japanese troops and the activities of Japanese civil and military officials and for this reason the new regime cannot be **considered to have been called into existence by " a genuine and spontaneous movement."**

What is meant by a genuine and spontaneous movement ? What precedent must serve as a guide for all future political revolutions ? How many independence movements were genuinely spontaneous ? Is it not true that in every oppressed country, the property owners, the bankers, the business men, the industrialists, and all others who have accumulated wealth, are opposed to any violent change that might jeopardize their standing or loss of their holdings ? Is it not equally true that in such countries there is always a so-called Tory element, bound by blood and other ties to the ruling class, who are also opposed to any change ? Is it not true that in every independence movement of modern history, these elements have uncompromisingly supported the regime in power and denounced the revolutionists as unrepresentative of the popular will ?

When the League Commission of Enquiry visited Manchoukuo, what class of people did it meet ? Did it investigate at first hand conditions outside the three or four important commercial cities in the railway zone or talk with the common people ? It did not. Such information as it gathered came from the element allied with the governing classes for despoiling the people, and who by the very reason of this connection are opposed to any change that might result in the loss of their standing or confiscation of their wealth. When it is remembered that practically every line of profitable business in Manchuria was monopolized by the governing class, the declarations of those associated with them in the exploitation of the people cannot be accepted as impartial evidence.

Careful investigation reveals that the majority of the 1,500 letters received by the Commission of Enquiry during their visit to Manchoukuo were written by the students of the North Eastern University at Mukden, all young men in the pay of or affiliated in some way with Chang Hsueh-liang. Experts attached to the Commission have publicly admitted that letters were also received through the foreign consulates and considerable information secured through consulates and missionaries. What right had these foreigners to intervene in the affairs of the people of Manchoukuo and speak either for or against them ?

Terrorized by an army of 400,000 men ; stood up against a stone wall or decapitated for uttering even a mild protest against their wrongs, how could the disarmed people of Manchuria start a spontaneous independence movement ? Where a people have no vote, no voice in the management of their own affairs ; no bill of rights ; where justice is unknown and the man with the gun reigns supreme, what procedure must they follow in order to free themselves and receive the approval of peoples who only a few short years ago were subjected to the same tyranny ?

The people of Manchuria, palsied with fear, had abandoned all hope for release from their sufferings. They could not believe after the incident of September 18, 1931, that the armies of their oppressor had been dispersed, that his power was broken and they were free. No unarmed people in any part of the world, who had suffered as they did, would have reacted in a spontaneous manner to assert their rights. Only a few of their more enlightened leaders understood what it all meant and even they had to proceed with caution until assured that the armies of the despot inside the

Wall would not be permitted to join with his dispersed divisions to re-establish his power.

No Pre-conceived Plan Apparent

It is suggested that without the presence of the Japanese troops and their resort to self-defense (which in two days dispersed the armies of their oppressor) the people of Manchuria could never have achieved their independence. That may be true, but what has this to do with Manchoukuo? The Japanese troops did not invade Manchuria for this purpose. They were already in the territory. They had a right to be there and it was their duty to defend the interests confided to their protection. What happened on the night of September 18, 1931, has nothing to do with the legitimate grievances of the people of Manchuria or the nature of their subsequent move for independence.

Japan declares that she acted in self-defense and this hypothesis is not denied by the League Commission. Although it is not incumbent upon the Government of Manchoukuo to defend Japan's case, it owes a duty to itself and to those who started the independence movement to emphasize a few pertinent facts.

If Japan had a pre-arranged program for overthrowing the old regime, the ground would have been carefully prepared. Her diplomats would have been fully informed and her case laid before the League and the interested Powers. What is more important, her railway guards in Manchuria would have been increased to full strength and reserve divisions dispatched to Korea to support the movement. That the Japanese railway guards provoked a major incident with only 10,500 men in a territory guarded by veteran armies numbering nearly 400,000, is contrary to all military strategy and reason. For, no matter how confident in the valor of their troops, the Japanese dared not assume that the Chinese would refuse to fight. To provoke a show-down under such conditions was the height of military recklessness, a hare-brained exploit that might well have resulted in the complete annihilation of the Japanese railway guards before reinforcements could have been rushed to their assistance. There could have been no assurance that the Chinese troops would disperse and their civilian officials desert their posts; therefore there could have been no definite program to set up a new government in Manchuria.

The mere fact that it took some months of preliminary activities before an independence plan could be drafted and agreed upon by the representatives of the people, corroborates this statement. Had there been collusion between the Japanese and the leaders of Manchuria, there would have been no delay in setting up the new regime. It required no urging from Japanese civil or military officials to start the movement for independence when the armies of Chang Hsueh-liang fled and refused to fight. The opportunity was created and the people through their leaders hailed the event as an answer to their prayers for deliverance.

Evidence of Experts Ignored

The Government of Manchoukuo protests against the hasty conclusions of a Report, which ignores the evidence of its own properly appointed expert. The people of Manchoukuo may be inarticulate, they may be poor and illiterate, but they are, in the last analysis, human beings, endowed with the same spirit and desire to live and enjoy the product of their toil that animates other more advanced peoples. To suggest that they were contented or that independence does not meet with their wishes, is not so much a reflection on their nationalism, as it is an insult to their manhood.

Even if the common people had taken no interest or part in forming the new government, it would not illegalize the action of their leaders in assuming control, once the opportunity for doing so presented itself. Chang Hsueh-liang's right to rule rested, not on the consent of the governed, but on brute force. Neither he nor his father had any scruples about putting down with a rough hand all opposition to their authority. The right to rule in China is not always achieved by open warfare. Medieval methods are still employed to eliminate political rivals. Under the warlord system, supreme power goes to the man strong enough to seize and hold it. If he is assassinated, poisoned, killed in action or in other ways removed, it is no affair of the Central Government. Taking advantage of Chang Hsueh-liang's misfortune in not being on the ground to defend his position, is a purely private matter between himself and those who succeeded him. The Central Government, however, has for the first time intervened in a private dispute and has made a warlord's fight its own. The new element in Manchoukuo, before assuming office, appealed to the people and received their consent to act in their name. The new regime is therefore legalized not only by traditional Chinese methods, but by the more modern conception of self-government. Manchoukuo may be a rebel State, but it revolted not against the Central Government which never exercised jurisdiction over their territory, but against their own local tyrant.

That Japanese individuals took part in fostering the creation of the new State in no way minimizes the legitimate nature of the independence movement. The Commission states in its Report (page 97) that the independence movement had never been heard of in Manchuria before September 1931, but this does not signify that the people were not ready to acclaim and follow any leader who would head an uprising. It fails to take note of several previous revolts on the part of high military officers which had been suppressed with unusual barbarity. In one case (that of Kuo Sung-ling) the naked, mutilated bodies of the insurgent general and his wife were exposed on the frozen ground outside the walls of Mukden for several days in order to strike terror in the hearts of the people.

Had the Commission journeyed into the highways and byways of Manchuria and talked with the common people, it would have learned why the desire for independence never found public expression. It would have seen on the walls of teahouses, restaurants and other public gathering places, the Police Posters in large characters; **"Talking About State Affairs Strictly Prohibited," or "Political Talks Prohibited."** It would have learned that these posters were the law, infraction of which meant immediate arrest and in most cases capital punishment. No one dared to voice even in private conversation his views on politics. When sentenced to death on the strength of secret accusations; when dragged from their homes or shops to be decapitated in the public thoroughfare or prodded at the point of the bayonet to the execution grounds, there was no court to appeal to for justice.

Too Eminent to Understand

The Commission is right. There was no open expression of a desire for independence before September 1931. If the distinguished nobleman who penned those lines in the Report had ever resided as a common subject in a country ruled by such a regime, he would understand why the people kept their mouths shut. The exalted Members of the Commission, Viceroys, Pro-Consuls, Governors all, could not be expected to understand the viewpoint of lowly common people who suffered in silence and prayed in secret for deliverance. Highly qualified for their original mission, they were handicapped by their careers, their caste and their prejudiced views when it came to understanding the cause of a downtrodden people. The opinions and conclusions of those who could and did understand these conditions, were set aside as of no value.

The Government of Manchoukuo challenges the Commission to cite any instance in recent history where a people groaning under such oppression have openly discussed their wrongs, let alone their independence. Look around the world to-day and it will not be difficult to find other countries where the people have been terrorized into abject submission to their fate. It is not necessary to go further afield than that model, peace-loving "Republic of Central Splendor," to witness the working of a system that imposes imprisonment, exile or death on those who publicly oppose its methods. Only a few years ago, the Chinese Delegates to the League were proscribed by the benevolent government they now represent at Geneva. What is the reason for the unending civil wars of China if not the expression of discontent against a despotism that has no more concern for the happiness and welfare of the people than a ravenous tiger has for its prey? The sole difference between China Proper and Manchuria was that the warlords of Mukden, Kirin, Heilungkiang and Jehol were sworn brothers and the first sign of discontent against their rule was followed by swift and merciless punishment. The people of Manchuria had no chance to rise in revolt.

Even a superficial investigation of the underlying situation would have convinced an impartial Commission of Enquiry of these self-evident facts. That the Commission failed to take them into consideration, invites the polite rejoinder that it entered Manchoukuo intent solely upon finding evidence to fit its preconceived ideas of the case, an accusation that finds support in its own Supplementary Documents. In no other instance has a High Commission sitting as a Court of Enquiry so cynically delivered a verdict opposed to the evidence of its own specially appointed experts. Is it any wonder that the people of Manchoukuo are incensed over this disregard of plain facts and have come together as one man to denounce and protest against the injustice of that part of the Report ? Is it any wonder that these people are not appealing meekly to the League for justice, but instead are asserting their right to liberty and announcing their determination to defend their independence at all costs ?

The Commission furthermore adds that the new State could never have been formed without the presence of Japanese officials, both military and civil. This statement is to a large extent true, but should be qualified by pointing out that these Japanese acted contrary to express orders from their Government in joining Manchoukuo leaders to advise them in matters of organization and procedure.

Some Forgotten Precedents

Have the Members of the Commission forgotten that the American Government was placed in the same embarrassing position during the Cuban war for independence ? Did not American citizens violate the neutrality laws by running filibustering expeditions to Cuba ? Did not the Cuban Junta have its Headquarters in New York City, where it openly recruited Americans to fight in its armies, raised loans and directed the shipments of arms and munitions to Cuba ? The American Government strained every effort to stop these illegal activities but could accomplish little in the face of a nation-wide sympathy with the Cuban cause. Are there not many other instances on record where the officials and private citizens of one nation have taken an active part in fomenting disorders and revolutions in other countries in order to advance their own national or personal interests ; activities frowned upon officially but secretly approved ? The list is a long one.

The world may have changed in the last few years and such precedents may not justify the unofficial activities of Japanese individuals in Manchoukuo. But human nature has not changed. There will always be independent spirits in all countries who will disregard the policies of their governments, the laws of neutrality, the covenants and other pacts, to take advantage of any opportunity to overthrow a system of government that reduces its people to slavery.

When one State can scatter its emissaries, propagandists and **agentes provocateurs** throughout all the countries of the world to foment disorders, strikes, revolutions, and bring about the overthrow of the established social order, and other governments fully realizing the danger to themselves, recognize and enter into relations with it for the sake of trade and profit, it seems the height of inconsistency to denounce the Manchoukuo Government for accepting the aid of a few Japanese subjects in creating a new State that will stand as bulwark against the spread of this menace.

As the direct result of this foreign intervention, old governments and the established order have been overthrown ; new regimes have come into power and been immediately recognized. In China, the whole central area is now part of this foreign system. Yet, in the face of the evidence that these internal revolutions are the direct result of foreign intervention, these new regimes are immediately recognized as expressing the will of the people, a recognition that would never be accorded had the intervention been open and above board.

No Apologies to Make

Japanese subjects did take part in the Manchoukuo independence movement, but this in no wise detracts from the plain statement that the demand and desire for independence already existed, needing only the stimulus of an organizing direction and an assurance that the armies of their old tyrant would not be let loose upon them, to spur the people to action. The Government of Manchoukuo frankly acknowledges that it asked for and received the advice of competent Japanese organizers in formulating its plan for independence. It also candidly admits that if left to themselves its leaders would have found it difficult to devise a proper system of modern government. The Government of Manchoukuo makes no apologies for accepting this friendly co-operation in establishing itself on a solid foundation and justifies its action by citing those lines in the Report of the Commission of Enquiry which state that without similar international co-operation, China Proper can never establish a strong, central government, competent to discharge its international obligations and consolidate its control over the whole country.

The Government of Manchoukuo furthermore recalls to the attention of the League that the precedent for its action is to be found, not in foreign countries, but in China Proper, where in 1926, a rebel Cantonese faction declared its independence of Peking and openly entered into an alliance with Moscow, not for the purpose of establishing the independence of its own province, but to conquer and impose its rule over the whole country. It recalls that neither the League nor the Eight interested Powers raised any protest against this flagrant intervention in the affairs of China, which ultimately overthrew the supreme rule of the Manchurian warlord, Chang Tso-lin, and handed over the whole of China Proper to the Kuomintang Dictatorship.

In view of this precedent created with the full approval of the League and interested Powers, the Government of Manchoukuo, representing thirty million free human beings, is entitled to exercise the same independence of action in seeking the aid and advice of Japan in order to defend its territory against a faction whose sole claim to rule is based on the recognition of the Powers and the weight of its armies. In plain words, if Canton is permitted to enter into an alliance with one foreign nation for the purpose of subjecting the people of all China to its rule, Manchoukuo is equally justified in requesting aid from another nation in establishing and defending its independence of a government which owes its existence to such methods.

The Case for Manchoukuo

By GEORGE BRONSON REA

The following was given by Mr. George Bronson Rea in an address before The Pan-Pacific Club of Tokyo on May 19 last :

THE invitation to address the Pan-Pacific Club of Tokyo is a special honor. In the last eight months I have presented and defended the case for Manchoukuo before gatherings in other countries and unofficially at Geneva, but this is the first opportunity I have had to talk to a group whose intimate and first-hand knowledge of Far Eastern problems renders superfluous any attempt to paint in the historical background. You are all familiar with the events of the past nineteen months and I will not tire you with attempting to review them.

I was invited by the Government of Manchoukuo to accept the post of Counsellor to its Ministry of Foreign Affairs and in that capacity I went to Geneva to be on hand in the event that the League required any further information about the new state. The attitude of the Government of Manchoukuo was, that as the new state was not a Member of the League, it was not bound morally or legally by any decision of the League. However, the Secretary General was informed of the presence at Geneva of General Ting, Mr. Edwards and myself and that if the League desired to call upon us for information, the Government of Manchoukuo had no objection. In other words, we did not go to Geneva to appeal to the League or to force ourselves upon it.

The League was not at any time interested in hearing Manchoukuo's side of the case nor was it influenced by any of the statements we succeeded in getting before it through the assistance of the Japanese Delegation. The League sent a Commission of Enquiry to the Far East to study the situation on the ground and report the facts to the League. This Fact-Finding Body transformed itself into the Prosecution, seeking only such evidence as would support its own preconceived views. It reported these facts to a Grand Jury composed of itself and then indicted Manchoukuo before a Court presided over by the Chairman of the Commission which tried the case **en camera** delivered its verdict and then dissolved itself. Its work was finished. The case was closed and there was no appeal. The Commission was accompanied by a large staff of highly paid experts, but where the facts and findings of these gentlemen conflicted with the views of the Commission they were rejected. It is perhaps the only case on record where a High Commission sitting as a Court failed to give due weight to the testimony of its own properly appointed experts in arriving at its decision. As a matter of fact, the Report was so filled with inaccuracies, inconsistencies and contradictions that had the League admitted evidence in rebuttal it would have been rendered worthless as a guide for any solution to the dispute. In effect, the League did not dare reopen the case and it has steadily refused to admit or consider any testimony or facts that might undermine the Report and compel another verdict.

Documentary Proof Ignored

As representative of Manchoukuo at Geneva it became my task to endeavor to break down that part of the Report concerning the creation of the new state. There was only one answer to the conclusion of the Commission that the new state did not meet with the will or the wishes of its people and that was to lay before the League documentary proof to the contrary. In the absence of any electoral machinery in China, the only way to ascertain the wishes of the people is through the traditional medium of the guilds, chambers of commerce and other public bodies. In the course of two months after the publication of the Report, the Government of Manchoukuo succeeded in obtaining from every public body statements and declarations as to their attitude towards the new independent state. These documents, to the number of 586, written in the original Chinese, Manchu and Mongol characters, signed and sealed by the responsible officials of these bodies were forwarded to me at Geneva and transmitted to the League. This collection of documents constituted the nearest approach to an expression of the will of the people that has come out of China. Yet these proofs of the existence of a national sentiment and desire for independence were consigned to the archives of the League, swept aside as of no value in counteracting the conclusions of the Commission.

Now, the conclusion of the League Commission that the new state did not reflect the desires of its people was based on the assumption that the population of Manchuria was overwhelmingly Chinese. If it could be proved that instead of being overwhelmingly Chinese, the population was overwhelmingly Manchu, then the Report and its Conclusions would have to be revised. General Ting, who came to Geneva as the personal representative of the Chief Executive, Mr. Pu Yi, is an authority on Manchu history and he insisted that a majority of the inhabitants were descendants of the old Bannermen. With his information as a guide and by checking up by careful research in all the books on China in the League Library it was disclosed that all the talk and publicity about the massed migration of Chinese into Manchuria to the point where they now form 98 per cent of the population, has no foundation in fact. On the contrary, it can be proved that in the last forty-five years, not more than 7,000,000 Chinese have emigrated to Manchuria and settled on the land, leaving a population of 21,000,000 to be accounted for.

My time is too short to go more deeply into this phase of the subject except to state that the population of Manchoukuo, instead of being 98 per cent Chinese, is in reality 75 per cent Manchu, that is, sons of the soil, born in the state, the legitimate heirs to the patrimony handed down to them by their Bannermen forbears. With this point established the case against Manchoukuo built up by the Commission, collapses and we find that instead of a people resentful of a change in their government, a people, who by very reason of their birth, their traditions and their ownership of the soil are fully justified in appealing to the principle of self-determination and setting up their own government. A summary of the facts surrounding this population problem was also duly forwarded to the League and circulated at the request of the Japanese Delegation. But neither this statement of facts or the receipt of the 586 letters was sufficient to influence the League to take a different view of the case.

Another Phase of the Case

There was still another phase to the right of the people of Manchoukuo to declare their independence and set up their own government which to my mind overshadows all others in its importance. In outlining my views on this you will understand something of my own philosophy and the motives which impelled me to identify myself with the new state. After thirty years of close contact with the march of events in the Far East I have come to the conclusion that it is impossible to hold 500,000,000 people together under one government in order to give effect to treaties which assume that these people form one national entity. For China is not a nation. It is a race, a civilization, split up into as many distinct and conflicting groups as exist to-day in Europe. Not until these people are permitted to work out their destinies along the same lines that govern our own conception of nationalism can we hope for permanent peace and progress in this part of the world. In our great desire for peace we are forgetting the fundamentals upon which permanent peace must be founded.

In order to give effect to certain treaties and doctrines it is urged that the territorial integrity of what is known as China has become fixed and unalterable. Even if it be admitted that the territories of Manchuria and Mongolia at one time formed part of the Manchu Empire, and, granting that the formula underlying these treaties is admissible, it is irrational to assume that this political connection must be a permanent one.

The fissiparous movement in China Proper is evidence that no treaties entered into between outside Powers and the Chinese Government of the moment can hold the nation together against the will of its people. The unification and territorial integrity of China, as contemplated by the treaties, can be accomplished only by the sword. For twenty years the people of China have been outraged, tortured, starved, enslaved, bled-white and massacred by the millions, in order that a political nostrum prescribed from without, might be forced upon them. Left to herself China would have long ago peacefully split into four or five independent states had it not been for this constant pressure to preserve the country intact for the furtherance of foreign political, commercial or financial reasons. This panacea of forcible unification cannot succeed. More millions of poor, struggling human beings, asking only the right to live and gain their livelihood by the sweat of their brow, will be ruthlessly slaughtered in order to establish a principle that violates the basic laws of humanity and is opposed to the most advanced political thought of Western civilization.

The Lessons of History

History tells us that no empire or state can permanently be held together by force alone. The powerful Moslem Empire, created by the sword, has disappeared. The World Empire of Spain is a memory. Sixteen Hispano-American states are now represented in the League of Nations, and the disintegration process at home is still at work. In order to avert civil war, the Republican Government of Spain has conceded full autonomy to the Province of Cataluna as the first step towards satisfying the cravings of its people for complete independence. Cataluna has now its own President—a republic within a republic.

The Great Empire " on which the sun never sets," has split into its component parts, each body politic standing on a basis of absolute freedom and equality, held together by ties of blood and economic interest. Several of these Dominions are Member States of the League, enjoying full sovereign powers, with the right to enter into treaties on their own behalf and enjoy independent diplomatic relations with other countries. Yet even this slender bond is being strained to the breaking point by the refusal of one of these units to take the oath of allegiance to the Central Power.

The British Empire has abandoned the legalities which held it together in order to preserve a unity that could not be enforced by the sword. The Congress of the United States has recently recognized the right of the Filipinos to complete independence. Even our own Great Republic has been subjected to terrific disintegrating strains. The preservation of the American Union, however, brought with it the boon of liberty to millions of enslaved human beings who now stand on a plane of full equality before the law with their former taskmasters.

If international co-operation for the internal reconstruction of China, such as the League Commission suggests, would assure that the 500,000,000 poverty-stricken, inarticulate, homeloving, peaceful and hard-working people would be released from slavery and invested as their rights as human beings, the unification of the country under such a program would go down in history as the greatest humanitarian achievement of the ages. If a representative government existed in China ; if the people enjoyed even their rights as human beings, there might be some justification for enforcing a doctrine which denies to them the right to revolt or to take advantage of any opportunity to assert their independence. But where there is no government, where brute force alone maintains the terrorized people in subjection, the doctrine as laid down in the Nine Power Treaty is opposed to those basic precepts of Humanity and Civilization from which all just laws and treaties derive their sanctions.

In the name of Humanity, the world has set the seal of its disapproval on war between two or more nations, but nothing has been done to terminate an unending series of senseless civil wars for place, power and pelf far more disastrous in loss of life and destruction of property than the Great War. I make the categorical statement that there have been more people killed in China in the civil wars of the last decade than in the Great World War. If we accept the statements of the Chinese themselves, the total would be more than double. Lin-Yu-Feng, one of the foremost Chinese essayists, states that in the Civil War of 1930 between Nanking and the Feng-Yen coalition more than 20,000,000 people perished. The slaughter goes on and not a voice is raised in condemnation of this useless sacrifice of human lives.

An Essential for Peace

If outlawry of war is due to purely humanitarian and not political reasons, then some way must be found to enforce the doctrine upon countries, whose rulers derive their right to govern from the weight of their armies. As long as one country, large as a continent and comprising within its borders one quarter of the world's population, is permitted to settle its inter-provincial disputes by the sword, other Powers will become involved for the protection of the lives and properties of their citizens. As long as the right to rule rests upon the possession of the strongest army, there will be unrest, discontent and strife.

Not until the machinery is created to give the people of China a voice in the management of their own affairs can these civil wars for power and conquest be eliminated. Sooner or later, the people of China must be permitted to decide their own form of government and elect those who are to rule over them. The people of all parts of China are entitled to say whether or not they will accept the rule of any particular racial group. For, notwithstanding all arguments to the contrary, each province in China constitutes a distinct political entity, intensely hostile to the intervention of any other province in their affairs. No one province can permanently consolidate its rule over the whole country without holding the people in subjection by huge armies of occupation deriving their maintenance from the conquered people.

Principles which influence the statesmanship of the most advanced nations of the world, are opposed to the use of force in checking the natural tendencies of colonies, dominions, protectorates or mandates towards complete political independence. Yet this guiding principle of Western statesmanship is held to be inapplicable to the Far East, where, to perpetuate a foreign-conceived and imposed doctrine, five hundred million people are condemned to exploitation, outrage and enslavement in order that some bandit or military overlord may be given all the time necessary to consolidate his rule over the whole country.

The question as to whether Manchuria belongs to the Hans or to the "Manchus" does not call for mobilization of armies or threats on the part of the Chinese that they will die to the last man before surrendering their claim to rule over this Homeland of another people. The dispute is not different from many other conflicts of political opinion that are now being solved amicably in other parts of the world. It is decidedly a matter that can be settled by leaving it to the vote of the people. The legal machinery for ascertaining their wishes does not at present exist but there is ample evidence in the telegrams and documents received by the League that a sincere desire for independence is now so strong and widespread that it would be unwise to ignore it. The people of Manchoukuo cannot be handed over to a central government that does not exist.

"What's Wrong with China"

Despite its many contradictions and inconsistencies, the Report of the Commission of Enquiry is clear and emphatic on the basic conditions prevailing in China Proper. The last suggestion of the Report (No. 10 "**International Co-operation in Chinese Reconstruction)** is the very essence of the findings of the Commission. Nothing can be done to give effect to the other conditions until a strong central government is functioning in China Proper which, as the Report recognizes, is possible only by building adequate means of transportation which will enable it to exercise its authority. A vast amount of time, money and effort has been wasted in diagnosing the ills of China, yet the verdict is always the same. The "Lytton Report" arrives at the same conclusions as the Strawn Report on Extraterritoriality and the Report of the Kemmerer Commission which based its recommendations on the assumption that a strong, central government existed in China. If the League is to preserve its prestige and usefulness, it must give careful consideration to this last suggestion of the Report of its Commission and assume the responsibility of assisting China to reconstruct itself to the point where a strong central government, capable of discharging its international obligations and its duties to its own people is set up.

Even under the most favorable conditions this task will take many years. To-day, with an unprecedented world economic depression drying up the sources of credit, it may be difficult, if not impossible, to raise the loans for paying for building the means of communications that will enable a strong central government to exist. In the meanwhile, must Manchoukuo submit to the authority of a group of Southern warlords and contribute her share of the revenues to maintain the armies upon which rests their right to rule ?

The time is long since past when people can be coerced against their will to remain in bondage to a system of government that denies to them their rights as human beings. Times have changed. Even the most advanced and so-called "imperialistic" nations have discarded force as an instrument to perpetuate their rule over people clamoring for independence or a larger share in the management of their own affairs. The fissiparous movements in those advanced states are being countered, not by the slaughter of innocent people, but by the cement of good-will, honorable treatment, friendly understanding and recognition of realities.

If there existed in China a government worthy of the name, one that could faithfully discharge its international obligations and its fundamental duties towards its own people and devote part of its revenue to public improvements or education, there might be some reason in urging the people of Manchoukuo to acknowledge its jurisdiction, but when no such government admittedly exists when a continuance of their allegiance would inevitably lead to further taxation for the upkeep of armies maintained to perpetuate their enslavement, it is hopeless to ask or expect the people of Manchoukuo to accept such a solution.

Conditions the League Faces

The Report of the Commission of Enquiry cannot be read as an indictment of Japan alone. It says clearly that peace in the Orient, peace in the world, cannot be attained as long as conditions in China constitute a menace to friendly relations. Since the conditions set forth in the Report as a solution to the problem cannot be fulfilled without a strong central Government in China, the final requisite for a satisfactory solution is temporary international co-operation in the internal reconstruction of that country. Here lies the task of the League ; the guaranteeing and raising of loans aggregating nearly a billion gold dollars ; the supervision of the expenditure of these huge sums ; the efficient direction and operation of the means of communications and their protection against bandits and militarists. This, in brief, is what the Report says that the League must undertake in order that a strong central Government can be set up in China. This is the fundamental issue before the League in the present dispute. Its duty and task are clear.

While the League is occupied in its herculean task, it should feel gratified in knowing that it will not have to extend its operations north of the Great Wall. This considerably reduces its sphere of action and its responsibilities. Manchoukuo will work out its destiny and, when China is united under an enlightened and strong Central Government representative of the whole people and with the interests of the whole people at heart, it will be time enough to ask its people whether or not they desire to unite their fortunes with a rejuvenated China.

The Government of Manchoukuo declares that it will never submit to an outworn political doctrine so diametrically opposed to the principles of the League, the fundamentals of Humanity and the cause of World Peace. The people of Manchoukuo cannot be coerced to place themselves under the rule of the Nanking Government or admit the right of any Chinese warlord to interfere in their affairs.

The people of Manchoukuo stand firmly on their inalienable right to rebel against oppression, misrule and injustice ; to exercise their right of self-determination, to secede from the rule of a bandit despotism ; to declare their independence and to set up their own government. It was their right and duty to throw off the yoke of their oppressors and provide new guards for their future security when the opportunity presented itself. The Government and people of Manchoukuo accept full responsibility for their actions and are prepared to maintain and defend their freedom by every means within their power. Invoking the fundamentals of civilization and the Rights of Man which to-day represent the most advanced policies of the more enlightened European states, the Government and the People of Manchoukuo appeal to the freemen of the world to cast aside the legalities and petty international politics of the moment and consider their case from the broader aspects of Justice, Humanity and World Peace. **Principles that apply in Europe, must apply with equal force in Asia.**

This is my conception of the ideals which underlie and justify the creation of the new state of Manchoukuo. Treaties and covenants which contravene the fundamental laws of humanity cannot endure. We are erecting the edifice of Peace on a foundation of sand. It stands to reason that with the abolition of war, empires and states can no longer be held together by force. The United States will never send another army to the Philippines to keep the Philippines in subjection against their will. Britain will never send an army to Ireland to hold the allegiance of the Irish. What is good and just for us of the West is good and just for the people of the East. The people of Manchoukuo, Manchus by every legal definition of nationality, have a right to be free, to separate themselves from the rule of alien warlords. In defending their cause I remain true to the traditions of my own people, my own country, and to those higher ideals upon which are founded not only our civilization but our Faith.

The Problems of the Day—And Their Solution*

By WANG CHING-WEI, President of the Executive Yuan of the Nanking Government

Still in the throes of foreign aggression, China is being confronted with a host of complicated domestic problems which, even if not so serious as likely to affect the stability of the Government of the day, are such that failure to solve them in the proper way may have some very unpleasant consequences. There is the problem of Sinkiang, the situation in the North-west and in Szechuen, the Tsingtao naval dispute, the opposition to the American wheat and cotton loan. All these problems, however, the Government is determined to solve in accordance with its settled policy, which may be summarized in the phrase " Unification by Reconstruction."

The Sinkiang Situation.—The trouble in Sinkiang broke out as far back as the middle of April. The causes were not quite clear at that time ; what was known being barely the fact that there had been opposition against Chin Ju-Jen, the then Provincial Chairman, on the part of a portion of the people and that subsequently, Liu Wen-Lung, then Provincial Commissioner for Education and Sheng Shih-Tsai, then Chief-of-Staff to the Border Defence Commissioner, also rose in opposition to Chin with the result that the latter was compelled to leave the Provincial Capital with Liu Wen-Lung and Sheng Shih-Tsai assuming respectively the posts of Acting Provincial Chairman and Acting Border Defence Commissioner.

As a matter of general principle, it would have been improper for a Provincial Commissioner and a Chief-of-Staff to oppose their superior officials. However, realizing that there were a number of causes underlying the present trouble in Sinkiang, the Central Government did not wish to take any definite action before it was thoroughly acquainted with the facts. Accordingly, it appointed Chief-of-Staff Huang Mu-Sung as Pacification Commissioner for Sinkiang and sent him there to conduct a personal investigation of the situation.

Since his arrival in Sinkiang by airplane, General Huang has submitted from time to time telegraphic reports on the situation. It was not until then that the actual state of affairs in Sinkiang became known to the Government. It also became clear that the causes of the Sinkiang trouble were chiefly to be attributed to the improper measures taken by the former Chairman, Chin Ju-Jen.

The inhabitants of Sinkiang may be broadly divided into the natives and the Hans (i.e., the Chinese proper). The natives are mostly Mohammedans. There are, among the Hans, persons who also profess Mohammedanism ; these are known as " Han-Mohammedans." Apart from these, there are also several other minority races. In this connection, it is important to realize that freedom of belief is guaranteed by Law and that races are equal before the Law. There may be differences in religious beliefs and in languages and customs between the various races, but there should not be any political discrimination. And never since the National Revolution in China has one religion been allowed to persecute another, or one race to oppress another race.

Among the inhabitants of Sinkiang there are persons who profess no religion as well as those who believe in Buddhism or profess Mohammedanism, the latter being the most numerous. But notwithstanding the fact that he was Chairman of the whole province, Chin Ju-Jen had gratuitously insulted the religion professed and worshipped by the majority of the provincials, the Mohammedans, by divesting, without the authorization of the Central Government, the Mohammedan prince of Hami of his position and titles and, furthermore, confiscating his properties, thereby throwing the people in general into a state of unrest and arousing the resentment and indignation of the Mohammedans in particular. This is one of the chief cause of the Sinkiang trouble, and for this Chin Ju-Jen must be held fully responsible.

Nor indeed can Chin Ju-Jen escape blame for the general political maladministration in Sinkiang, the lack of discipline of the troops and the unauthorized conclusion with Soviet Russia of a so-called Sinkiang-Soviet Provisional Commercial Agreement. It is needless to point out that the power of conducting foreign relations rests exclusively in the hands of the Central Government and that the local Government has absolutely no right of

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concluding any agreement with foreign countries. The offence against the State which Chin Ju-Jen has committed in thus concluding an agreement with the Soviet Union without the authorization of the Government, is indeed one of no little seriousness. Thus, although it would have been improper for Liu Wen-Lung and Sheng Shih-Tsai to oust their superior official. We must not at present lose sight of the fact that the Sinkiang trouble was precipitated almost entirely by the maladministration of Chin Ju-Jen, and in this light the Central Government naturally could not blame Liu Wen-Lung and Sheng Shih-Tsai.

Following the outbreak of the Sinkiang trouble, Ma Chung-Ying, a Divisional Commander, moved his troops from the Kansu border into Sinkiang. Notwithstanding the repeated telegraphic orders from the Military Affairs Commission enjoining him to stop his advance, Ma, while nominally professing obedience, continued in his advance until he finally occupied Ku-cheng, a city which is only about 100 *li* distant from Tihua, the Provincial Capital. It was thus nothing short of a revolt that he was attempting to stage.

Upon his arrival at Tihua, Pacification Commissioner Huang had endeavored to pacify Ma by peaceful means. These, however, turned out to be fruitless. As a result, Sheng Shih-Tsai was compelled to engage Ma and succeeded finally in repulsing the latter on June 14. Chang Pei-Yuan, a Divisional Commander at Ili also assisted in the campaign against Ma.

From the above, it should be obvious that we must place the responsibility for the Sinkiang trouble, not upon the shoulders of the people, not upon Liu Wen-Lung and Sheng Shih-Tsai, but entirely upon Chin Ju-Jen and Ma Chung-Ying—the trouble being first precipitated by Chin Ju-Jen and later aggravated by Ma Chung-Ying. It may be added that these two delinquents will be dealt with by the Government in a fair and proper manner.

The Readjustment of the Situation.—The fact that the military situation in Sinkiang has reached a temporary solution, however does not justify us in thinking that there will be no further trouble, unless due note is taken of the following three points:

(1). Politically, it may be noted that the so-called Committee for the Maintenance of the Sinkiang Provincial Government in charge of the province is composed of as many as from forty to fifty members. Under such circumstances, a clean and efficient administration is a practical impossibility. In the readjustment of the Sinkiang situation, therefore, we must first of all improve and cleanse the political administration so that a satisfactory regime may be established, determined, among other things, to uphold the principle of freedom of conscience and of racial equality.

(2). Militarily, the organization of the Sinkiang Provincial Forces is so complicated that only a fundamental reorganization of the military system, under the direct control of the Central authorities can solve the situation.

(3). Diplomatically, Sinkiang, being situated on the border and contiguous to Russia, has had many causes of friction with the latter. Taking advantage of lack of constant contact with the Central Government, people like Yang Tseng-Hsin and Chin Ju-Jen, thus entered into direct diplomatic intercourse with Soviet Russia. This is however an anomalous and dangerous practice which the Government is determined to rectify by the centralization, in its own hands, of all power of diplomatic negotiation.

It is on these three fundamental principles—centralization of diplomatic control, direct central control over the provincial military forces, maintenance of freedom of conscience and racial equality—that henceforth the administration of Sinkiang must be based if peace and order is to be permanently restored. But apart from these, reforms should be introduced in the provincial finances which are in a more confused state than in any other province in the country. Paper money has been issued to the staggering amount of 150,000,000 taels, while the value of these notes has so depreciated that one tael note is actually worth only 3 tael cents, or 3 per cent of its face value. The situation, if allowed to continue unrectified, will become completely untenable. Fundamental measures, such as the establishment of a branch of the Central Bank, must be immediately instituted to readjust and improve the finances of the province. And unless a thorough readjustment of the finances is effected, all efforts at political and military reorganization would amount to little more than nothing.

In addition, there is further the problem of communications to be considered. At present, Sinkiang is easily accessible only by air. Now it is true that the province—in extent as large as several provinces put together—is for the greater part a desert and difficult of access, but at the same time it is rich in fertile and arable land. Owing, however, to the lack of convenient means of communications, it has been impossible to fully develop this vast tract of land to any extent. This thus demonstrates the urgent need for the early completion of the Kansu-Sinkiang Railway and the construction of a network of highways within the province.

In short, it would be folly to consider the Sinkiang situation as being immune from further trouble merely because military activities have been brought to a temporary conclusion. The readjustment of the political and financial administrations; and the development of education and communications are all urgent tasks which yet remain to be carried out. In this lies indeed the crux of the question. And whether or not Generals Liu Wen-Lung and Sheng Shih-Tsai, respectively Acting Chairman of the province and Acting Border Commissioner for Sinkiang, would be entrusted by the Government with the permanent charge of the provincial political and military administrations would entirely depend on whether they are ready to follow and observe the three fundamental principles referred to.

The Question of Kokonor.—Besides Sinkiang, Kokonor (Chinghai) also demands attention in connection with the North-western question.

Lately, the Government has announced, by official Mandate, the appointment of Sun Tien-Ying as Reclamation Commissioner for the Western District of Kokonor. This appears to have aroused considerable apprehensions on the part of the people in Kokonor and is therefore a point which requires some explanation.

We must bear in mind that Kokonor though very extensive in area, has however only a population of a little over one million. The sending of a party of troops to Kokonor by the Government for reclamation purposes will undoubtedly prove beneficial, instead of being detrimental. For the development of a province with such an extensive area and sparse population as Kokonor will prove of benefit to the whole of China, to Kokonor and especially to the people of Kokonor. Thus, instead of entertaining groundless apprehensions, the people of Kokonor ought to welcome and assist in the realization of this scheme, which the Government is determined to carry out in accordance with the wishes of the Central Authorities (i.e. the Central Political Council). It is thus hoped that the Mongolian and Tibetan Affairs Committee will launch an extensive propaganda to enlighten the people on this point.

The Situation in Szechuen.—As for Szechuen, the situation there has become most critical as a result of disturbances created by the Communist bandits under Hsu Hsiang-Chen, who have recently invaded the province from Southern Shensi and which made necessary the appointment of General Liu Hsiang as Bandit Suppression Commander for Szechuen.

For over a decade, the various military commanders in Szechuen have been engaged in a series of interminable civil wars "within locked doors." Military operations, which were brought to a conclusion only last year, have broken out again this year, thereby giving the Communist bandits an opportunity to create disturbances. This state of military rivalry is the natural consequence of the system of "garrison areas," whereby each commander is assigned a certain specified garrison area. It is thus hoped that by placing all the units under the control of General Liu Hsiang for bandit-suppression purposes, this undesirable practice may be removed.

The present situation in Szechuen is comparable to the state of "armed peace" which prevailed in Europe on the eve of the Great War. Hostilities can break out almost at any moment between the rival military leaders who are all armed to the teeth, having under their commands at present a total of about 500,000 troops—troops who are such a drain upon the provincial resources that the farm tax has been collected in advance up to the 56th year of the Republic (1967). The most urgent thing in liquidating the present situation in Szechuen is, therefore, for all military commanders to sink personal differences and co-operate with the Central Authorities in the suppression of the Communist banditry. As for their respective rights and wrongs, the Government will naturally make a fair and just settlement. It is only when internal strife is ended that it will be possible to suppress the Communist banditry, and to solve the various political and financial questions affecting Szechuen.

The Tsingtao Naval Dispute.—Whatever may now be said against predatory militarism in China, and however great the urgency of a reorganization of the army system, we as Chinese need never be ashamed of our Army as such. Disgraceful episodes there may have been in Chinese military history, and more than we care to admit, but ill-equipped and badly armed the Chinese Army has shown its mettle on many occasions and evoked the admiration of foreign military experts—during the Northern Expedition, in the struggle against the Japanese invaders, at Shanghai, Kupeikou, Hsifengkou, etc. In talking about our Navy, however, we can only do so with regret. Nothing has been done to add to its strength since 1895 or to bring the existing vessels up-to-date. And our hearts can only be filled with shame when we think of the naval scandal which is taking place before our eyes to-day.

Following the desertion of the cruisers *Hai Chi* and *Hai Shen* and the training ship *Tsao Ho* from their home base at Tsingtao for the South, Admiral Shen Hung-Lieh tendered his resignation from both his posts, as Commander of the North-east Squadron and as Mayor of Tsingtao. The Government relieved Admiral Shen of his naval command but instructed him to remain at his post as Mayor of Tsingtao. No successor to Admiral Shen as commander of the North-east Squadron has, however, yet been nominated, owing to the fact that the Squadron at Tsingtao has made it known that they are prepared to accept orders only from the Peiping Military Council, not from the Ministry of Navy which issued the mandate relieving Admiral Shen of his naval duties.

The point now is that in the event of war it would be proper and natural for the North-east Squadron to take orders from the Peiping Military Council but in refusing to accept administrative orders issued by the Ministry of Navy they are virtually committing an act of mutiny. The Army, too, takes orders from the Military Commission when on the field, but the appointment of the Army personnel remains in the hands of the Ministry of War. Should the Tsingtao Squadron thus persist in refusing to take orders from the Ministry of Navy, it would automatically cut itself from the Government.

It has been freely asserted that within the Navy there are two cliques—the Fukien and the non-Fukien cliques—and that one of these cliques dominates the Ministry of Navy. This has been taken as a pretext by the Tsingtao Squadron to refuse the Ministry's orders. Now should this Tsingtao contention be true, and as a result the Navy be divided by geographical distinctions, the value of the more or less obsolete Chinese Navy as a national fighting force could only be reduced to less than nothing. The point, however, is that all naval appointments above the rank of captain are being made only with the approval of the Executive Yuan upon the recommendation of the Ministry of Navy and in consultation with the Military Council. How can in these circumstances the Ministry of Navy be partial to the Fukienese ?

The opposition by the Tsingtao Squadron against the acceptance of Admiral Shen Hung-Lieh's resignation from his command of the Squadron by the Ministry of Navy is both unreasonable and without any grounds. It is hoped that they will acquaint themselves with the constitutional and administrative procedures. For no Government can allow itself to be influenced by an attitude which, if passed unchallenged, would certainly result in the disruption of the entire administrative system. The Government will do what is right, but cannot allow itself to be intimidated.

Unification by Reconstruction

The above analysis of the situation in Sinkiang, Kokonor, Szechuen, and Tsingtao shows the importance of devoting our entire energy as a nation to the task of reconstruction and unification. But instead of seeking unification through the use of armed force, we must aim at achieving unification by reconstruction.

Force as a means of achieving unification is a most insecure measure ; the more we attempt to unify by force, the more disintegrated will the country become, and the more shall we find it impossible to achieve unification. On the other hand, if we seek unification through reconstruction, the material as well as spiritual relation between the various parts of the country will become closer day by day, and a force against disintegration will be naturally created. Under such circumstances, much as they may desire it, persons with aggressive designs will find disintegration a matter beyond possibility. It is only the kind of unity which is achieved in this way that can be considered as real unity.

If it is really proposed to seek unification through reconstruction, then the so-called " reconstruction" must consist in concrete work and not merely in lip-service.

Thus, if the practice of regional domination by military men remains uneradicated and all military men continue to be engrossed by the desire to expand their personal armaments, not only will all sources of revenue be drained by military expenditures, but the expansion of armaments will also inevitably result in a state of interminable war and chaos. This would still be seeking unification by force and not by reconstruction. This is a distinction which must be clearly understood.

Now, if we are determined to seek unification through reconstruction and to exert our efforts for the enforcement of such a policy, we should first decide what kind of reconstruction enterprise we have to begin with our efforts. But judging from the present circumstances in China, it would appear that agricultural reconstruction is by far the most urgent of all reconstruction enterprises, and it is in this light that the recent American wheat and cotton loan, which has recently been passed by the Central Political Council and the Legislative Yuan, must be regarded.

This means that the criticisms levelled by the South-western leaders against this loan are entirely unwarranted, as, for one thing, the critics appeared to have overlooked the fact that enormous quantities of wheat and cotton are imported annually by China from abroad. The gist of the criticisms is that the influx of the large quantities of wheat and cotton to be purchased under the loan agreement would tend to lower the price of native cotton and thus prove detrimental to the native cotton producers. The point however is that, even had no such loan been concluded, the country would still have to import from abroad about the same quantity of wheat and cotton as provided for by the loans. This can be proved by the Customs figures which show that a total of $315,754,357 worth of foreign cotton, flour and wheat was imported last year and that of this, $196,950,006 worth of the goods was imported from the United States.

Further, as regards the disposal of the proceeds of the loan it has been definitely decided by the Central Political Council, the Legislative and the Executive Yuans that the proceeds should not be used for the financing of domestic military campaigns nor for the defraying of current military and administrative expenses, but exclusively for reconstructive purposes, particularly for agricultural reconstruction.

Upwards of 80 per cent of the country's population are farmers ; and it would be thus futile to talk of reconstruction if we neglect agriculture. For agricultural reconstruction is necessary not only for the development of agriculture but also for the development of commerce and industry. Industrial and commercial prosperity, as we all know, depends upon the sale of the produced articles. As the principal consumers are the 80 per cent farming population, it follows as a natural corollary that only when the farmers possess the purchasing power is there any prospect of industrial and commercial development and that in order to develop commerce and industry, it is necessary first to increase the purchasing power of the farmers. Since increase of the purchasing power is usually the result of the development of power of production, there is no doubt that the object of agricultural reconstruction must consist in the development of the productive power of the farmers.

As I have pointed out previously, it is necessary, in order to achieve national salvation, to consolidate and enhance the national strength ; and to increase the power of production of the people in order to consolidate the national strength. How can we increase the productive power of the people ? The most important method is to carry out agricultural reconstruction.

In this connection, there is another point to which we must give our attention ; and that is, the so-called agricultural reconstruction is not a question confined merely to agriculture. We must realize that a particular question is often involved in a general question. Solution of the general question results automatically in that of the particular question ; while, on the other hand, if the general question remains unsolved, the particular question will also be impossible of solution. Thus, if we devote our attention solely to agriculture, to the neglect of all other political and military questions, it would be impossible to proceed with the program of agricultural reconstruction.

Militarily, if bandits are rife and troops are running amuck, the farmers would find it difficult even to escape death and destruction. How can we possibly talk of agricultural reconstruction under such circumstances? Politically, if the political administration be unsatisfactory and the country be infested with corrupt officials, the plight of the farmers would become more and more distressful and it would be equally impossible to talk of agricultural reconstruction.

Again, education has also a bearing upon agricultural reconstruction that should not be underrated. For example, apprehension is being entertained in certain quarters that the present cotton loan, while beneficial to the cotton mills, will prove to be detrimental to the farmers. These people seem to be unaware of the fact that according to the Customs statistics, an enormous quantity of foreign cotton is being imported into the country annually. Why is it that the mill interests have imported foreign cotton, instead of purchasing it from the Chinese farmers? Was it because the domestic supply was insufficient to meet the demand? After careful investigation, it has been found that one of the main causes lies in the fact that native cotton is often of a quality much inferior to that of foreign cotton. This inferiority is due probably to the fact that on account of the lack of necessary knowledge, the farmers do not know how to improve the quality of their products, or that to gain more profits, the farmers have adulterated their products by the admixture of inferior substance or water.

We must realize that the proper way of promoting native products is to have the courage to be ashamed of our inferiority to others and to have the tenacity and perseverance to improve our own products. It would not do to rely merely upon the invocation of patriotism as a means of inducing the purchase of native products. Therefore, in order to promote industry, attention must be paid to the method of cultivation as well as the morality of the people. It will be seen thus that agricultural reconstruction depends also partly upon education.

Communications are also of importance in their bearing upon agricultural reconstruction. For example, it has been said that the supply of wheat and rice in China should be sufficient to meet the needs of the entire nation. This statement ignores the fact that while the supply is sufficient in certain localities, it is often far from being so in other places. Thus, while famished people in Shensi are now eating the leaves of trees, the harvest is so abundant in certain localities in Kiangsu that the stored up grains have begun to decay and it is even proposed to burn them up. Thus, the lack of good means of communications has rendered it impossible for the surplus supply of one locality to meet the needs of another. Agricultural reconstruction should aim therefore not merely in the increase of production but also in the adjustment of supply to demand; in other words, surplus supplies in certain localities should be made to meet the needs of those in which the supply is insufficient to meet the demand. It is only by developing means of communications that this object can be attained. Thus, if we do not desire to talk of agricultural reconstruction, well and good; but if we do, we must realize that communications is not a whit less important than education. Without good communications, it would be impossible to institute collective control or readjustment of supply and demand.

The important point to realize, therefore, is that agricultural reconstruction is not a question which concerns merely agriculture but is one which involves the whole political, military, educational and communications questions. This means that militarily, we must enforce strict discipline; politically, make the Government clean and solicitous of the interests of the people; educationally, enhance the knowledge of the farmers and raise their general moral standards; and in the matter of communications, secure more convenient transportation facilities in order to make it possible to readjust supply and demand and to institute a system of collective control. It is only when all these general questions are solved that a solution of this particular question can be effected; that is to say, it is only when the political and military administration, education and communications are developed that agricultural reconstruction can be successfully effected.

The national crisis having come to such a pass, the most important means of achieving national salvation and perpetuation of the national existence lies in the development of the productive power of the people; in order to develop the productive power of the people, it is necessary first to carry out agricultural reconstruction and in order to prosecute agricultural reconstruction, it is especially necessary to remove all obstacles and increase efficiency in the political, military, educational and communications fields. This is the path along which we must strive to make steady and continual progress.

ED. NOTE:—A former article by Wang Ching-Wei, "The Road to National Salvation" appeared in the April number of *The Far Eastern Review* and in error was credited to *The Shanghai Evening Post and Mercury* as the original source of publication. The article in question first appeared in *The People's Tribune*.

Japanese Cotton Mills in China

By *EISABURO KUSANO*

When all the Japanese cotton spinning and weaving companies unanimously decided in June, 1933, not to buy the Indian raw cotton as a retaliatory measure against a series of anti-Japanese steps taken by the British Government in British India, one of the colorful questions that presented itself as a side issue was how the Japanese mills in China would cope with the situation. Whether or not they would also stop using Indian cotton in sympathy with the Japanese mills at home was a point of interest. For the Japanese cotton spinning and weaving enterprises in China, with their combined equipment of 1,762,812 spindles, 283,160 doubling spindles, and 17,790 looms in Shanghai, Tsingtao, and Hankow, are worthy of attention and comment, apart from the question of the national sentiment, but as an influential economic factor.

And, the Association of Japan Cotton Spinning Companies in China has adopted the attitude of presenting a solid front against Britain by acting as far as possible in concert with the Japanese master spinners and weavers at home. They have decided not to purchase Indian cotton in principle, although they cannot give it up altogether on account of their peculiar position. Too, it was in consideration of their peculiar position that the Japanese mill owners at home also decided to be lenient toward them, leaving it entirely to their discretion as to whether they buy or not the Indian cotton.

What is meant by the phrase "peculiar position" may be summarized as follows:

1. The transportation from British India to Japan of Indian cotton is conducted entirely by the sole agent of the Japan Cotton Spinners' Association by virtue of a contract between the Association and shipping companies including the N.Y.K., the O.S.K., and the P. & O. This agent in India attends to the allotment of space as well as the shipment of Indian cotton. When the Association decided to suspend the import of Indian cotton pending a favorable development in the present controversy, all that the Association had to do was to instruct the agent in India to stop shipments until further notice.

In like manner, the import of the Indian cotton into China is conducted through the Society for Promotion of Mutual Benefit in Transportation of Indian Cotton to China, locally known by the name of Yin-Mien Yu-Hua Lien-i-hui. This society, however, is made up of Chinese and Japanese members. It means that the society's function cannot be suspended through any decision the Japanese members alone may make. The Japanese mill owners in China, in order to carry out any plan to boycott Indian cotton, must withdraw from the society. Such a withdrawal, however, would mean the collapse of the society, and what is more serious is that, such a step would likely throw the entire cotton industry in China into chaotic confusion beyond control.

2. Even if the Japanese mill owners in China managed to withdraw from the society and carried out the boycott running the attendant risks, they have not sufficient influence over the Chinese to control the entire market with the result that the Japanese mills acting alone would place themselves in a decidedly disadvantageous position.

3. The present Japanese retaliatory measure is entirely different in nature from the Chinese boycott of Japanese industrial manufactures. But it is difficult fully to make the Chinese public understand and appreciate the difference. In the circumstances, it is dangerous to act harshly at present as it may stimulate Chinese anti-Japanese activities which have been gradually subsiding in recent months.

4. There are two kinds of Japanese mills in China. One group has no "parent" company in Japan and these are entirely independent in China. The other group includes mills which are operated in China by Japanese companies at home. There is a considerable difference of interests between these two groups of Japanese mills in China, and, because of this difference, it would bring about an unfavorable outcome, from broader point of view, to force all these Japanese mills in China act in concert.

As far as the present controversy goes between British India and Japan over the former's proposed prohibitive tariff to shut out Japanese goods—principally the cotton manufactures, the Japanese mills in China are likely to be affected favorably in the end, although they have pledged support to their compatriot mills at home.

Now that the Japanese weavers have decided not to import even the yarn made with Indian cotton in China, the Japanese spinners in China may not expect brisk transactions in this direction. Nevertheless, the market quotations in Japan for yarn and manufactures, especially that made with Indian cotton, sharply advanced as soon as the decision was made not to import Indian cotton. Moreover, the price of Chinese raw cotton is also rising, as Japan needs larger volume thereof as a substitute for the Indian product. Such a development in the situation cannot fail to improve the market in China at large, and eventually benefit the Japanese mills there.

The Japanese cotton spinning and weaving enterprises in China have had innumerable troubles, especially since the outbreak of the Manchurian incident in September, 1931, due to pressure exercised upon them through the Chinese anti-Japanese manoeuvres. Their business was so seriously affected that there were many occasions when it was predicted that they were doomed.

A sudden improvement of the situation has resulted, however, from the conclusion of the armistice in North China, more particularly as the result of the alleviation of the antagonistic policy of the National Government of Nanking. But for the impending flood in the Yangtze Valley and its inevitable devastating effects on business in general, the prospects of Japanese mills in China have again become brighter. It is all the more so in view of the fact that the National Government of Nanking is reported to be planning to levy considerably higher duties on the import into China of cotton manufactures.

Origin and Development

It was in 1902 that the Japanese launched the cotton spinning and weaving enterprises in China. The Shanghai Cotton Spinning and Weaving Co., Ltd. was established in Shanghai that year as the result of its purchase of two American mills, the Hsieh-Lung and the Hsing-Chin. The second was promoted in 1909, it being the Naigai Men Kabushiki Kaisha (The Naigai Cotton Co., Ltd.) established also in Shanghai.

The outbreak of the World War and the subsequent hectic boom brought enormous profits to these Japanese mills in China. It stimulated other Japanese cotton enterprises in China. This tendency was then further encouraged by the abrupt advance in Japan of the market price of commodities and wages during and after the War, and also, by the increase of the customs duties in China, for these three factors rendered the management in China of the cotton enterprises all the more advantageous.

At the end of the World War, there were three Japanese cotton spinning and weaving companies in China, viz., the Shanghai, the Naigai, and the Nikka (Jih-Hua). These companies operated 10 mills of which the combined equipment stood at about 400,000 spindles.

A wholesale expansion of the Japanese cotton enterprises in China then took place during 1924 and 1925. Consequently, there were, at the end of 1926, 15 Japanese companies which had installed 1,257,000 spindles and 6,690 looms. Their total investments were then valued at Y.200,000,000.

Meanwhile the Chinese cotton spinning and weaving enterprises also made remarkable progress. Their combined equipment amounted to 1,770,000 spindles in 1926. The enterprises run by those other than the Chinese and the Japanese, however, remained inactive. The British, who were the forerunners in foreign cotton industry in China, had shown hardly any progress, while the German and American enterprises went out of business.

According to the annual report of the Federation of International Master Cotton Spinners and Manufacturers' Associations, the aggregate total number of spindles in China stood at 4,093,000 spindles in January, 1932, it including 1,701,000 spindles that belonged to Japan. The number of Japanese spindles in China registered further increases during 1932, as will be given later.

Production in China

The Japanese mills in China produce an extensive variety of yarns, its counts varying from less than 10s to even 80s, but the main products are 16s and 20s. A general tendency, however, is that these mills are gradually advancing to production of higher counts of yarn, the same as the Japanese mills in Japan, leaving the field of lower counts of yarn to the Chinese spinners.

The cotton spinning and weaving industry in China has made remarkable progress especially in recent years. So much so that the country is almost self-contained where the yarn supply is concerned, and it is a small quantity of 42s and yarns of still higher counts that are at present exported from Japan to China. Furthermore, the country is fast becoming self-contained in the lower grade of cotton textiles as well. Japan's export to China of cotton textiles, too, is gradually being limited only to finer quality of goods and to finished manufactures.

That China's cotton spinning and weaving industry in general has made such an impressive development in recent years is due to more than one factor. Most prominent of them all is that the cost of production is small, it resulting mainly from low wages. Another important factor is the restoration to China of tariff autonomy.

The following table gives the total import into China of cotton yarn, the import into China from Japan, and the Chinese export of Chinese yarn during the 13 years ending 1931: (Unit: bales).

Years	*Total Import*	*Import from Japan*	*Chinese export*
1919	470,209	191,899	22,401
1920	441,792	225,059	23,218
1921	424,479	230,795	8,605
1922	406,493	296,255	12,920
1923	258,348	161,676	29,667
1924	191,891	158,029	49,010
1925	215,707	141,243	21,668
1926	149,760	80,658	64,076
1927	98,446	36,397	113,224
1928	94,981	29,899	116,607
1929	78,042	25,214	114,912
1930	54,143	18,726	109,956
1931	15,983	6,380	(Unknown)

As regards the relationship between the cotton spinning and weaving industry in Japan and China: one recalls first of all that there was a heavy import into Japan of Chinese yarn in 1927. It is true that Japan imported Chinese yarn from time to time intermittently previous to that period. Never before, however, was the volume so large as that registered during April and May, 1927, when the monthly import reached 20,000 bales, respectively, in round figures. It was a revelation of what may happen, though the heavy import resulted mainly from the abrupt depreciation of silver, and normalcy was brought back as soon as silver improved.

The real significance of that temporary heavy import into Japan of Chinese yarn in 1927 consists in the possibility that the Chinese yarn has now developed into a formidable rival of the Japanese spinners at home and that the Japanese spinning companies are likely to be threatened by the Chinese invasion of the home market whenever the opportunity presents itself in the future.

Another important discovery in recent years is that China can be thorough-going in her anti-Japanese activities. Their boycott of Japanese goods used to be limited only to those imported from Japan, but following the outbreak of the Manchurian incident, they started boycotting the goods produced by the Japanese mills in China as well. And, they carried it out in a most thorough manner, so much so that the Japanese spinning and weaving mills in China were severely affected.

Outstanding Equipment

On December 31, 1932, there were 15 Japanese cotton spinning and weaving companies that operated outside of Japan, viz., in China, the leased territory of Kuantung, and Manchoukuo. Their combined total equipment was 1,788,492 spindles, 285,260 doubling spindles, and 18,295 looms.

Of the foregoing total, the Japanese mills in Shanghai alone had 1,280,216 spindles (including 5,040 mule), 266,360 doubling spindles, and 12,638 looms. The Japanese mills in Tsingtao had 367,780 spindles, 16,800 doubling spindles and 4,852 looms, while those in Hankow had 24,816 spindles and 300 looms. And, there were no more Japanese mills in China. The aggregate total equipment of these mills in Shanghai, Tsingtao, and Hankow amounted to 1,672,812 spindles, 283,160 doubling spindles, and 17,790 looms.

As regards the Japanese mills operating in Kuantung and Manchoukuo, the former were equipped with 84,320 spindles and 1,020 doubling spindles (no loom), while the latter had 31,360 spindles, 1,080 doubling spindles, and 505 looms.

Further details of the names and equipment of these Japanese cotton spinning and weaving companies in China, Kuantung, and Manchoukuo are:

A. China: a. Shanghai:

1. Naigai Men Kabushiki Kaisha

(The Naigai Cotton Co., Ltd.)

Head Office: Dojima-Kitamachi, Kita-ku, Osaka, Japan.
Business office: Tsaiteng Road, Shanghai.

Factories	*No. of spindles*	*Doubling spindles*	*Looms*
No. 1	32,000	20,000	1,008
No. 2	32,000	—	785
No. 3	23,040	—	—
No. 4	40,000	23,200	—
No. 5	54,400	31,200	—
No. 6	20,800	—	—
No. 7	34,400	20,480	780
No. 8	40,000	20,000	—
No. 9	25,480	—	895
Totals	302,120	114,880	3,468

2. Dai Nihon Boseki Kabushi Kaisha.

(The Japan Cotton Spinning Co., Ltd.)

Head office: Nichome Azuchimachi, Higashi-ku, Osaka, Japan.
Business office: No. 56 Szechuen Road, Shanghai.
Factory: 98,112 spindles, 24,800 doubling spindles (no loom).

3. Shanghai Seizo Kenshi Kabushiki Kaisha (Kungta)

(The Shanghai Silk-Cotton Manufacturing Co., Ltd.)

Japan office: c/o The Kanegafuchi Boseki K.K., Itchome, Misakimachi, Hayashida-ku, Kobe, Japan.

Factories	*No. of spindle*	*Doubling spindle*	*Loom*
Kungta No. 1	49,552	11,880	1,248
Kungta No. 2	42,792	9,240	1,051
Totals	92,344	21,120	2,299

4. Shanghai Boshoku Kabushiki Kaisha

(The Shanghai Spinning & Weaving Co., Ltd.)

Head office: No. 49 Szechuen Road, Shanghai.
Japan office: c/o The Toyo Menka K.K., Sanchome, Koraibashi, Higashi-ku, Osaka, Japan.

Factories	*No. of spindle*	*Doubling spindle*	*Loom*
No. 1	22,432	—	670
No. 2	30,376	—	582
No. 3	79,984	20,920	1,052
No. 4	44,744	2,000	—
No. 5	35,552	—	858
Total	213,088	22,920	3,162

Note: The number of spindles of the No. 4 factory includes 5,040 mule.

5. Nikka Boshoku Kabushiki Kaisha (Jih-hua)

(The Japan-China Spinning & Weaving Co., Ltd.)

Business office: Laoposheng Road, Shanghai.
Japan office: c/o The Mengyo Kaikan, Bingo-machi, Higashi-ku, Osaka, Japan.

Factories	*No. of spindle*	*Doubling spindle*	*Loom*
Putung	52,256	—	507
Tsaochiatu	55,552	—	—
Hsiho	118,464	34,200	—
Huafeng	25,600	13,320	—
Total	251,872	47,520	507

Note: The Huafeng mill is placed under the management of this company by its proprietor.

6. Yuho Boseki Kabushiki Kaisha (Yufeng)

(The Yuho Cotton Spinning Co., Ltd.)

Business office: No. 7 Hankow Road, Shanghai.
Japan office: Nichome, Dojima-Hama-dori, Kita-ku, Osaka, Japan.
Factory: 112,400 spindles, 10,560 doubling spindles, 780 looms.

7. Toka Boseki Kabushiki Kaisha (Tunghua)

(The Toka Cotton Spinning Co., Ltd.)

Business office: Szechuen Road, Shanghai.
Japan office: Dojima-Kitamachi, Kita-ku, Osaka, Japan.

Factory	*No. of spindle*	*Doubling spindle*	*Loom*
No. 2	20,736	—	—
No. 3	20,800	—	—
Totals	41,536		

8. Kabushiki Kaisha Toyoda Boshoku Sho

(The Toyoda Cotton Spinning & Weaving Co., Ltd.)

Head office: No. 200, Chissufeierh Road, Shanghai.
Japan office: Nishi-ku, Nagoya, Japan.
Factory: 94,720 spindles, 4,800 doubling spindles, 1,296 looms.

9. Doko Boshoku Kabishiki Kaisha

(The Doko Cotton Spinning & Weaving Co., Ltd.)

Japan office: Nichome Dojima-Hama-dori, Kita-ku, Osaka, Japan.

Factories	*No. of spindles*	*Doubling spindles*	*Looms*
Yangshupu	32,424	—	1,126
Tsaiteng	41,600	19,760	—
Totals	74,024	19,760	1,126

b. Tsingtao:

1. Naigai Men Kabushiki Kaisha

Tsingtao office: Kuantao Road, Tsingtao.

Factories	*No. of spindles*	*Doubling spindles*	*Looms*
No. 1	27,200	4,800	—
No. 2	30,400	—	—
No. 3	32,800	—	—
Totals	90,400	4,800	

2. Dai Nihon Boseki Kabushiki Kaisha

Tsingtao office: The Suzuki Bldg., Kuantao Road, Tsingtao.
Factory: 69,520 spindles, (no doubling spindle), 2,142 looms.

3. Shanghai Seizo Kenshi Kabushiki Kaisha

Kungta No. 5 factory: Tsangkow, suburbs of Tsingtao.
98,672 spindles, 4,400 doubling spindles, 2,294 looms.

4. Fuji Gass Boseki Kabushiki Kaisha

(The Fuji Gassed Cotton Spinning Co., Ltd.)

Head office: No. 47 Sakamoto-cho, Nihonbashi-ku, Tokyo, Japan.
Tsingtao factory: Tsangkow, Tsingtao.
31,360 spindles, 1,600 doubling spindles, 416 looms.

5. Nagasaki Boshoku Kabushiki Kaisha (Pao Lai)

(The Nagasaki Cotton Spinning & Weaving Co., Ltd.)

Business office: No. 70, Nichome, Yokobori, Higashi-ku, Osaka, Japan.

Tsingtao factory: Tsangkow, Tsingtao.
35,168 spindles, 2,800 doubling spindles, no loom.

6. Nisshin Boseki Kabushiki Kaisha (Lung-Hsing)
(The Nisshin Cotton Spinning Co., Ltd.)
Head office: No. 20, Naniwa-cho, Nihonbashi-ku, Tokyo, Japan.
Business office: Hsiassufangchuang, Tsingtao.
Factory: 42,660 spindles, 3,200 doubling spindles, no loom.

c. Hankow:

1. Taian Boseki Kabushiki Kaisha
(The Taian Cotton Spinning Co., Ltd.)
Head office: c/o The Nihon Menka K.K., Nichome, Nakanoshima, Kita-ku, Osaka, Japan.
Business office: No. 4 Taiping Road, the 3rd special district, Hankow, China.
Factory: 24,816 spindles (no doubling spindle), 300 looms.

B. Kuantung:

1. Naigai Men Kabushiki Kaisha
Business office: Chinchow, Kuantung, Manchoukuo.

Factories:	*No. of spindle*
No. 1	29,600
No. 2	33,600
Total	63,200

2. Manchu Fukubo Kabushiki Kaisha
(The Manchuria Fukushima Cotton Spinning Co., Ltd.)
Japan office: c/o The Fukushima Boseki K.K., Nichome, Tamaemachi, Kita-ku, Osaka, Japan.
Factory: Huichouchiatun, Choushuitze, Kuantung, Manchoukuo.
Equipment: 21,120 spindles, 1,020 doubling spindles, no loom.

C. Manchoukuo:

1. Manchu Boseki Kabushiki Kaisha
(The Manchuria Cotton Spinning Co., Ltd.)
Japan office: c/o the Fuji Gassed Boseki K.K., Sakamoto-cho, Nihonbashi-ku, Tokyo, Japan.
Factory: Suehiromachi, Liaoyang, Manchoukuo.
Equipment: 31,360 spindles, 1,080 doubling spindles, 505 looms

Notes: 1. The foregoing statistics were taken from the semi-annual returns of the Japan Cotton Spinners' Association, Osaka, published on April 15, 1933.
2. The Japanese mill in Hankow was forced to close on account of the acute business depression in April, 1933.

Manchoukuo's Commercial Possibilities*

By Lt.-Col. H. St. CLAIR SMALLWOOD, F.R.G.S., Lately Aeronautical Adviser to the Chinese Government

In the constant search for new markets it behoves the British exporter to remember that Manchoukuo, or the new Manchuria, is a country of 400,000 square miles, with a population of well over 30 millions and a program of development which should afford scope for those who can see a little further ahead than their competitors. The Manchoukuo Budget comes up now for consideration and it will then be seen how much the country thinks it can afford to spend on its " Ten year plan." Every country must have a "plan" nowadays and Manchoukuo is determined not to be left behind. This particular plan is of undoubted interest to the British manufacturer as it includes provision for the building of 2,400 miles of new railway (with an ultimate aim of 15,000 miles), 36,000 miles of new roads, and a scheme for an air route of 2,100 miles. Naturally, this transport development opens up possibilities for manufacturers of roadmaking machinery, motors, particularly trucks and lorries, and suppliers of railway material and aircraft.

Importers may be reminded, on the other hand, that this market exports 300 million Haikwan taels worth of agricultural products annually, chiefly soya beans, and though Great Britain has not been a great consumer of soya beans, oil or flour in the past, the bean is being milled for flour by the Berczeller process in England, and Japanese milled Soya flour is also being imported into Great Britain in small quantities. The protein content of this flour is over 40 per cent, as against 13 per cent in wheaten flour; the fat content 20 per cent, as against two per cent, and the starch content less than one per cent against 70 per cent. The use of soya flour for adding to wheaten flour is growing in the U.S.A. and the above rough analysis affords evidence of its valuable nutritive properties. The possibility of larger areas coming under cultivation for the soya bean opens up a vista of new crushing mills to be erected, while oil drums must be provided for transportation and storage of the oil.

Great Mining Possibilities

In the mineral sphere there are, without doubt, further coal areas to be exploited and there is certainly a large area where alluvial gold exists and which can only be satisfactorily dealt with by means of large dredging plants. There is reason to believe that the province of Jehol may contain other mineral deposits as yet unthought of, while there are undoubted goldfields in Heilungkiang, Kirin and Fengtien provinces. There are said to be 113 " goldfields " in Heilungkiang and 54 in Fengtien, though what constitutes a " goldfield " is rather difficult to define. A Russian mining engineer has estimated a reserve of unmined gold at a value of more than 400,000,000 dollars (Mex.). Oil shale exists in fairly large quantities and there is said to be a layer of oil shale covering the whole of the Fushun coalfield. This is estimated at the huge figure of 5,400,000,000 tons!

The industrial life of Manchoukuo can hardly be said to have begun, but imports of raw cotton and cotton yarns have started and in time there is no doubt that industrialization will grow. Silk worms are cultivated, and the climate of the country seems favorable to sericulture, so that with cheap and abundant labor one may look for growth in this industry. The brewing of kaoliang wine is on the increase and this is also the case with the production of soy. These two products are produced from the two main crops kaoliang (millet) and soya beans. A small grass industry is beginning and hopes are also expressed that in time the hides produced in Manchoukuo will be locally tanned. Salt is produced in large quantities, but this industry is not likely to benefit the British manufacturer. Owing to the large amount of timber brought down the Yalu and Sungari Rivers there should be early opportunities of selling timber milling machinery.

Scope for British Enterprise

The authorities in Manchoukuo have announced since the inception of the state that the policy of the " open door " will be adhered to and though Japan has the advantage of proximity there are certain directions in which British manufacturers should be able to compete successfully for the country's trade. I know that there have been statements in the Press recently to the effect that Manchoukuo will not continue to keep the trade door open, except to those countries which have recognized the State, and, as Japan is the only country which has so far accorded the country formal recognition, a literal interpretation of such a statement would mean that the door is closed to all other nations. Actually, not once, but many times it has been stated that Manchoukuo welcomes foreign trade and investment. In the *Asahi* annual English Supplement His Excellency Mr. Kenkichi Yoshizawa, the Japanese Foreign Minister, has lately reiterated this statement in the following words :—" It need scarcely be again repeated that all we desire in Manchuria is peace and quiet, equal opportunity and the open door. The co-operation of the capital, energy and ability of all countries is welcome there."

Granted that there are trade opportunities in this market, what can be done to take advantage of them ? I suggest that, in

(Continued on page 304)

The British Export Gazette.

Recent Progress of the Oil Locomotive*

The recent expansion of oil engine traction in Russia and the Far East, together with the attention given to this important subject at the York meeting of the British Association, make apropos a brief review of the latest practice.

Following the successful operation of the 2–6–2 oil-electric locomotive built in 1929, there has been a rapid development in Japan, eleven 600 b.h.p. units being now in traffic, ten of them being provided with electric transmission. All are similar to the 1929 machine, with a large double-armature motor driving the wheels through a geared jack shaft and rods. The sound mechanical design of these locomotives may be examined in Fig. 1, which shows the general arrangement of the first vehicle. The descriptive particulars are well known and need not be repeated here.

For purposes of comparison the 600 b.h.p. geared locomotive shown in Fig. 2 has been constructed. The mechanical portion is much the same as that of the oil-electric locomotives, the main difference being the removal of the cab to one end. Contrary to what would be expected, the geared is the heavier of the two types. Practically all the difference is made up in the prime mover, for the 600 b.h.p. M.A.N. engine incorporated in the electric machines has been replaced by a supercharged engine of twice the weight.

Krupp's were responsible for the complete locomotive, and as far as the transmission was concerned drew largely upon their experience in constructing the gear box for the Lomonosoff 1,200 b.h.p. locomotive. Compared with that machine there are two main differences. The magnetic main clutch has been replaced by a hydraulic system, which in normal working is coupled mechanically, the oil only coming into use during a gear change. Secondly, the prime mover of the Soviet locomotive is reversible, while in the Japanese locomotive reversing is effected by a supplementary shaft in the gear-box. In both machines the gear-box clutches are of the magnetic type. From the 17 seconds of the Russian locomotive, the time for a complete gear change has been reduced to five seconds, and tests have shown this period to be sufficient to prevent shocks to the couplings on the train.

The small number, and the value, of the speeds provided seems to be open to criticism. With a rated engine speed of 540 r.p.m. the three-speed gear-box gives train speeds of 6¼, 15½ and 37 m.p.h., the last-named being somewhat high for a shunting locomotive, even when running light. Intermediate speeds are obtained by regulating the revolutions of the main engine, and it was probably for this reason that the Krupp engine was preferred to others whose speed and power ranges were not so great.

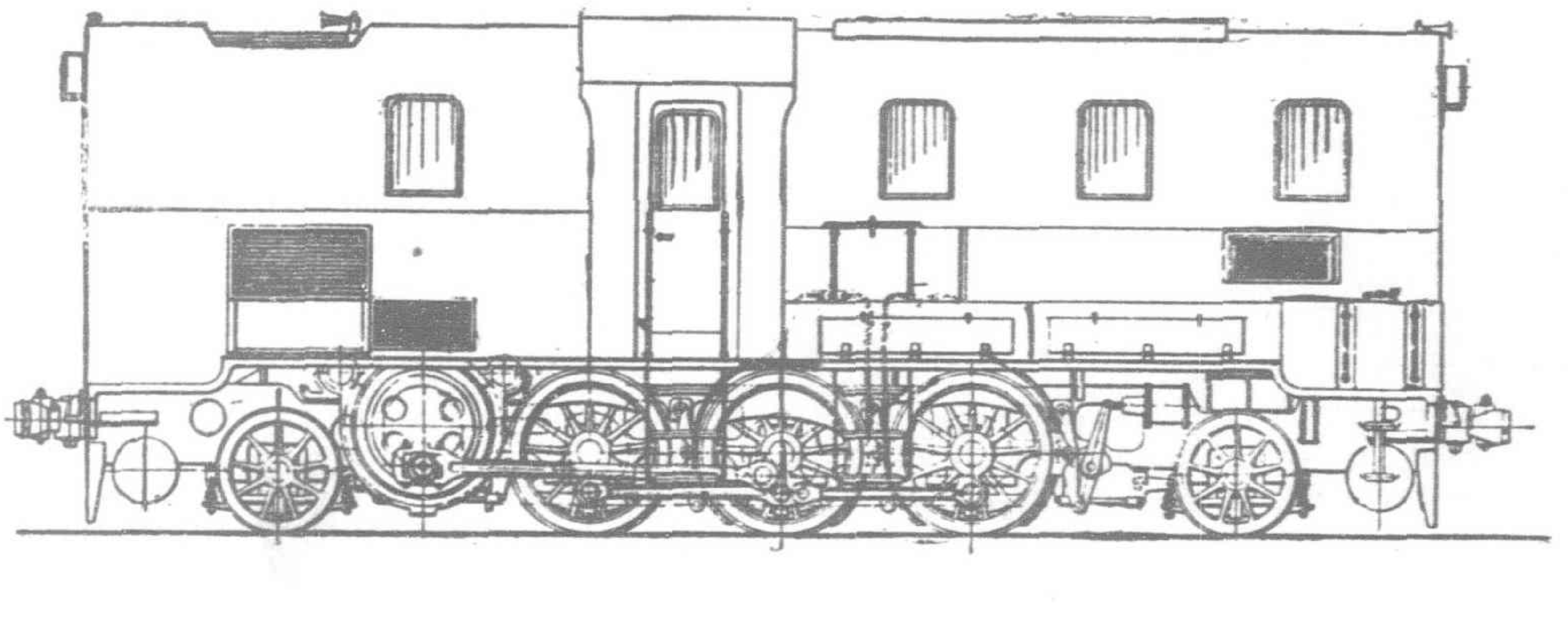

Fig. 1.—Japanese Oil-Electric Locomotive

Russia

The designs of the later Russian locomotives have been derived directly from the experiences gained with the two machines of 1924-5. In the latter year Professor Lomonosoff laid down certain points which were to be specified for all future oil-electric locomotives, and these improvements are embodied in the 1,200 b.h.p. locomotive to his design which has recently been set to work. They comprise, mainly, a flexible coupling between the main engine and generator ; separately driven pumps for the cooling water and piston cooling oil ; and forced ventilation for the traction motors.

In this latest 4–10–2 locomotive the M.A.N. engine is virtually duplicate with that of the 1,200 b.h.p. Diesel-mechanical unit. Electric braking is provided and is operated from a separate controller in the cab, but for reasons of expense and weight it will not be fitted to the locomotives now being erected at Kolomna. The cooling system is that devised by Professor Lomonosoff after the arrangement (which included a cooling tender) fitted to the first locomotive had proved unsatisfactory. In the present lay-out—which has been adopted for all the Soviet engines between 300 and 1,500 b.h.p.—the cooling elements are mounted on the end of the locomotive ; a separately driven Betz fan pulls air through the radiator bank and ejects it upwards through a specially shaped trunk.

Standardization has been studied in the 600 b.h.p. 2–8–0 and 2–8–2 locomotives turned out in March and November, 1931. The motors of the former are duplicate with those of the 1,200 b.h.p. locomotives, although four of them are much above the oil engine's capacity, while the main generator and auxiliary apparatus are the same as those of the 2–8–2 machine. Both types have a high-speed M.A.N. engine similar to those used in Japan and Manchuria. Some difficulty was at first experienced in burning "mazout" in these engines, although no trouble was forthcoming in the 1,200 b.h.p. units. "Mazout" is the coarse fuel resulting from the distillation of benzine and lubricating oil from the ordinary Caucasus fuel oil. After various adjustments a satisfactory method of burning this fuel was attained, and it is now universally used for the Russian oil locomotives, all of which are working east of the Caspian Sea. Non-stop runs up to 110 miles in length have been made in freight service by the 2–8–0 locomotive, brief particulars of which will be found in Table I.

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*The Engineer

The Secheron individual axle drive (Fig. 3) has been used to transmit the torque of the six double-armature motors of the 1,500 b.h.p. locomotive delivered to the Soviet Government some five months ago. Only the 17-ft. height of the Russian loading gauge permits the application, which is unique among oil-electric locomotives. A double power plant, consisting of two 750 b.h.p. Sulzer engines, is incorporated, but the cooling and auxiliaries are generally as in the new 1,200 b.h.p. locomotive. On test the engines showed their ability to maintain 825 b.h.p. for over an hour, and a maximum for ten minutes or so of 860, so it would appear that liberal rating has been carried a stage too far. Although this locomotive, which is to the design of N. Dombrovolski, was ordered in 1927 along with the last-described 1,200 b.h.p. machine, delivery was much delayed by the political unrest in Russia, which resulted in the oil locomotive department having a chequered career.

As mentioned in *The Engineer* for January 29 last, the Soviet authorities did not even contemplate electric transmission for sizes round 300 b.h.p., and in consequence of this policy a four-speed gear-box has been fitted to the new shunting locomotives. The principles of the Lomonosoff and Japanese oil-mechanical units have been forsaken for yet another clutch arrangement, and the torque of the 300 b.h.p. M.A.N. engine is transmitted through a spring clutch, while the gear-box clutches are of the multiple-disc type, actuated by pneumatic cylinders to which compressed air is led through fixed piping. In order to avoid a break in tractive effort during a gear change one of the gear clutches begins to engage before the other is completely disengaged. Reversing of the locomotive is effected by two loose bevels on the first transverse gear shaft, to which they can be coupled by means of a clutch operated by oil under pressure.

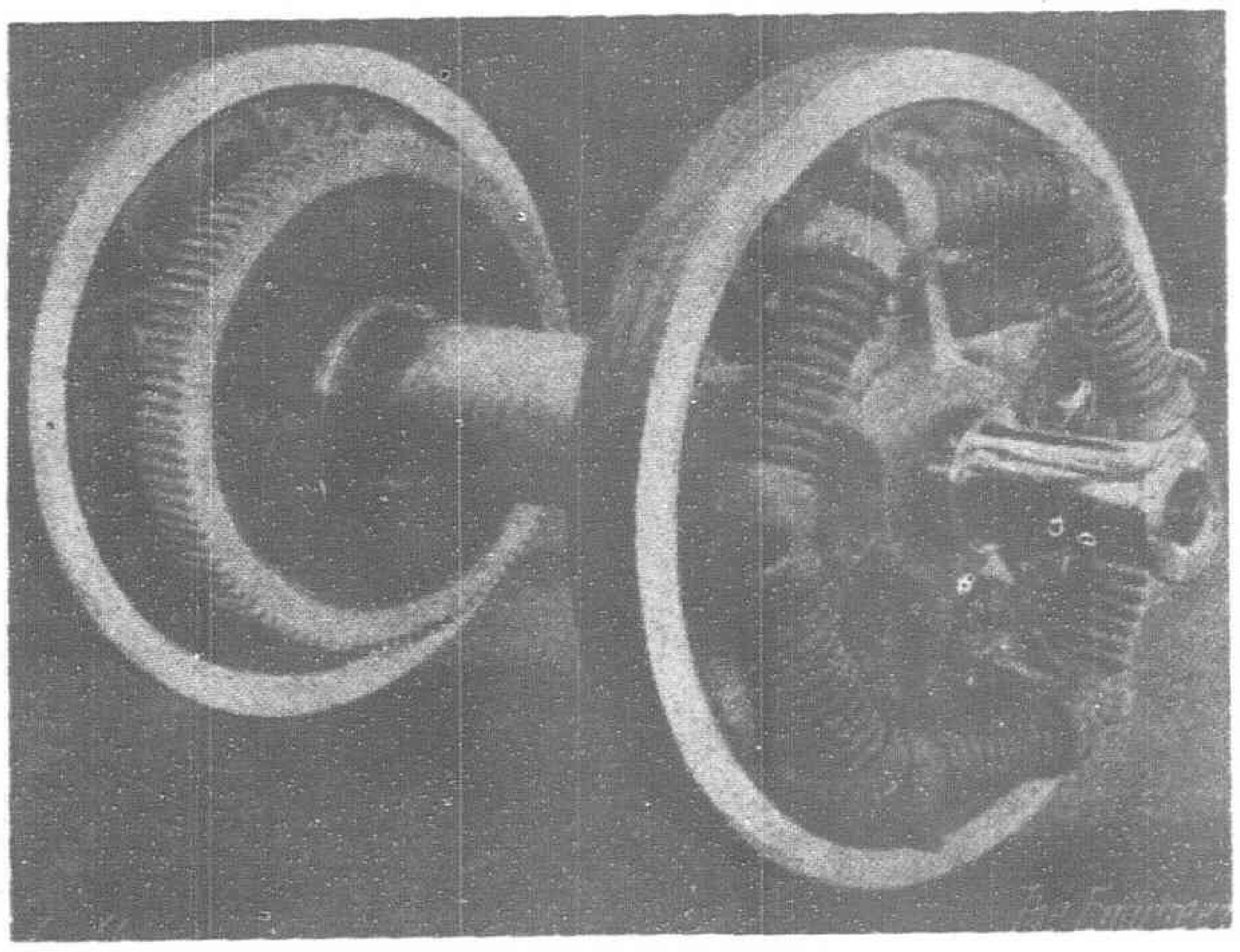

Fig. 3.—Secheron Axle Drive

Siam

There is no doubt that the oil-electric locomotives sent out to Siam at the end of 1931 by Frichs have done exceedingly well. It is too early to make any statements as to maintenance costs, but their introduction has enabled the authorities to accelerate and improve the services and allowed them to reduce the fares on one section. The 4–8–4 engines (Fig. 4) have been working the Southern expresses since their inception, and one of them has run right through to Singapore for the edification of the Federated Malay States Railway officials, who are closely watching the performance. Trailing loads up to 420 tons have been handled on the express schedule, and a weekly mileage of 2,400 has been maintained by some of the machines.

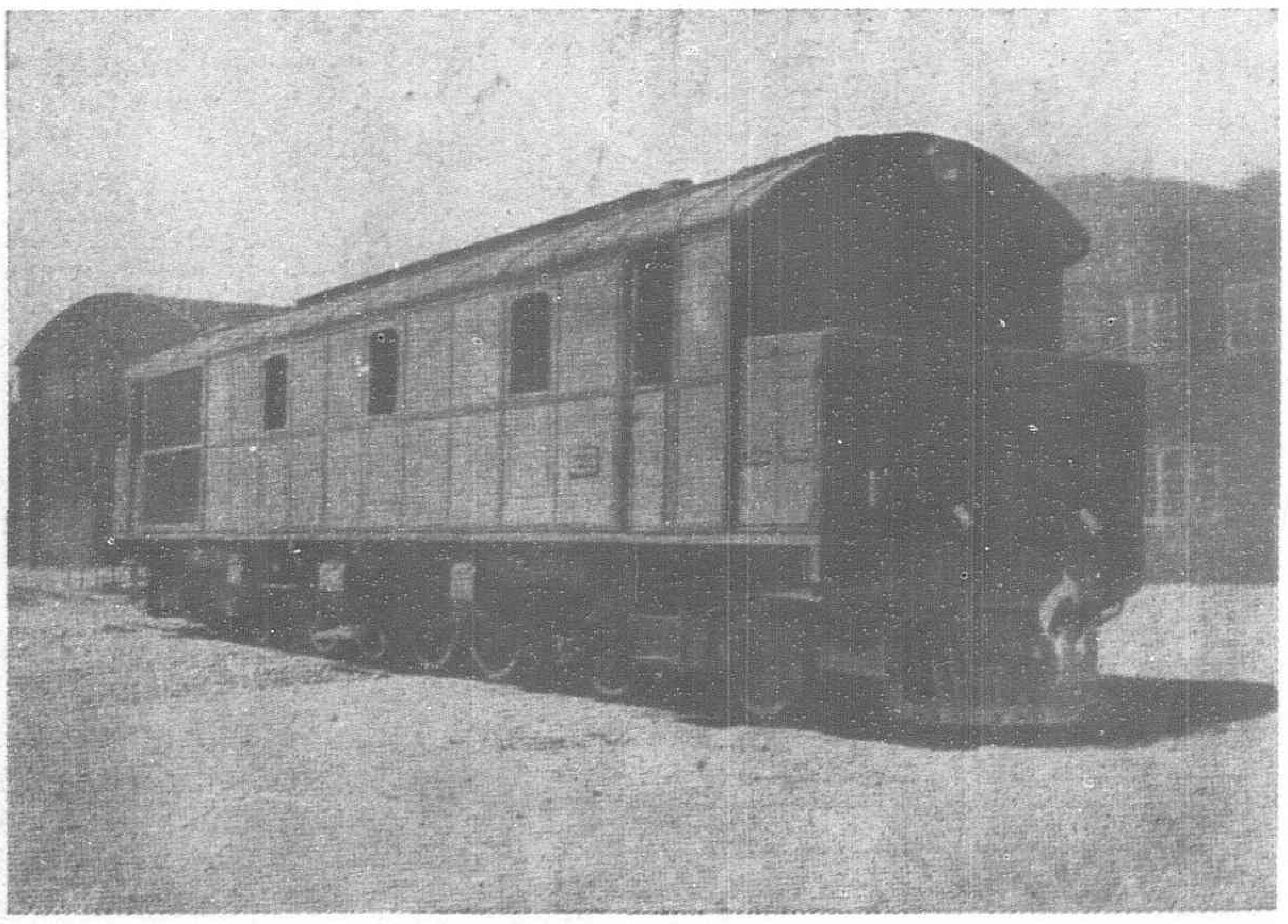

Fig. 4.—Siamese Oil-Electric Locomotive

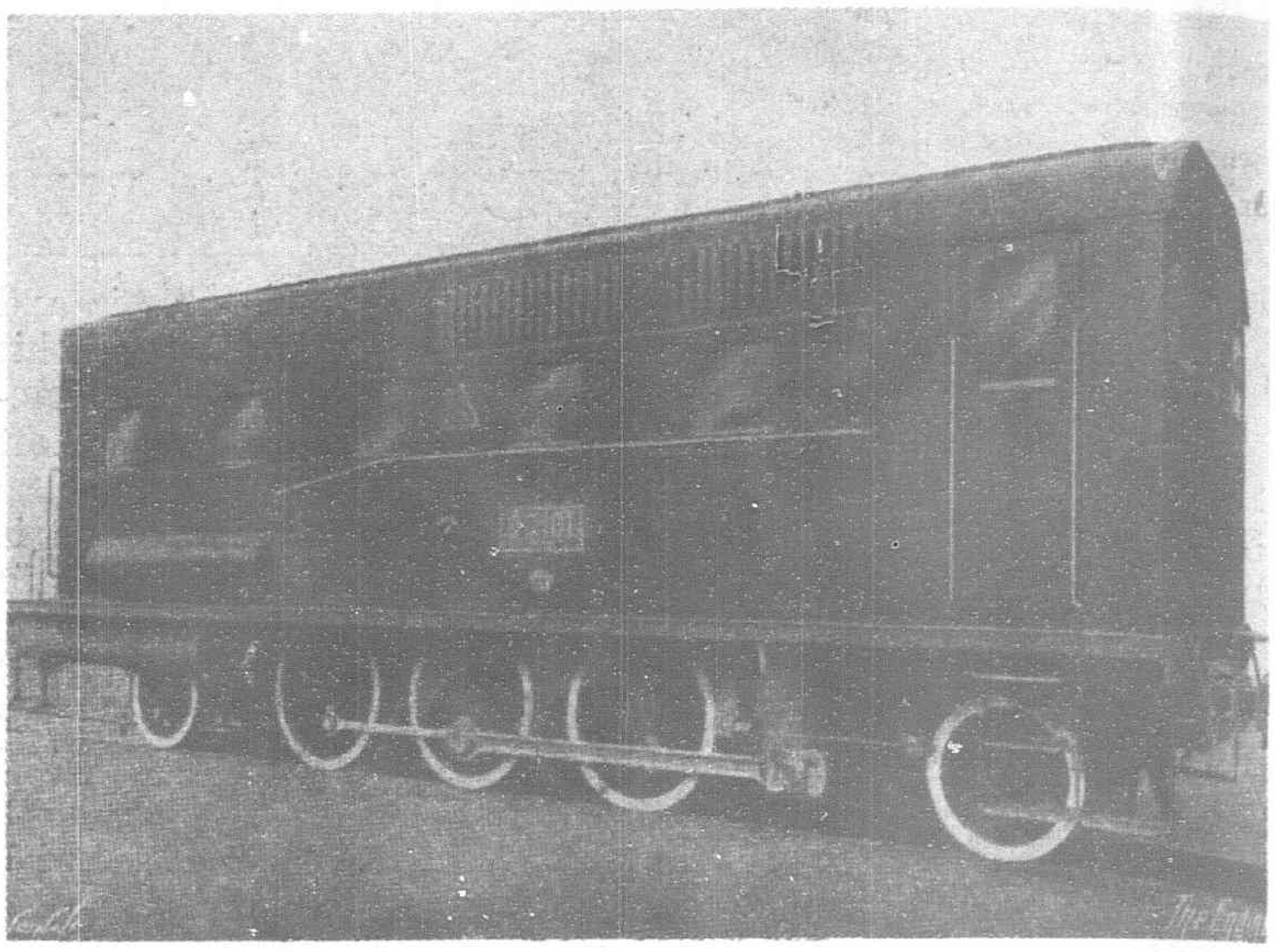

Fig. 2.—Japanese Oil-Mechanical Locomotive

The satisfaction given by these locomotives can be traced to the same root that has led to the success of main-line oil traction in Russia, Denmark and the Argentine—that of having locomotive and railway men fully responsible for all phases of the design. Frichs build the engine and mechanical portion in the same factory, but they have realized that this of itself is not sufficient, and have placed railway men in full control.

An interesting sidelight is thrown on the remarks of various speakers at the recent British Association meeting by these Siamese engines. During the discussion on Oil Engine Traction, it was suggested that for main line work the cost of an oil locomotive was some two and a half times that of an equivalent steam engine, while an exponent of the new vehicles said that the cost was not twice, (but he was very careful to state that that was so only on the debatable) assumption that a smaller number of oil locomotives was required, and the cost taken over the lot. The actual price of one of these Siamese locomotives was 3.64 times that of the " Pacifics " which previously worked the trains, and the high price cannot be excused on the score of only " one of," for six were ordered at the same time.

Sir Henry Fowler rightly criticized one speaker's figures for the cost of steam locomotives. He might well have done the same to the values suggested for oil-electric locomotives. The railway management which was offered a 2,000 b.h.p. oil-electric locomotive for £26,000 would probably close the bargain at once, unless the design was a freak, for purchasers have been accustomed to receiving offers of locomotives of half that power at only 10 to 15 per cent less cost. A 1,200 b.h.p. oil-electric locomotive for main line goods works was recently offered at £23,000, whereas the " Consolidations " which now do the work cost roughly £6,400 each for ten off. It is only reasonable to suppose that an order for ten oil-electrics would bring the price down to £20,000, but there would still be much to cavil at. This is not an isolated case. The price of some 1,000 b.h.p. passenger locomotives lately set to work abroad was within £200 of that of the oil goods locomotive just mentioned. But it is impossible to get at the true cost, for, consequent upon bad trade conditions, the practice has grown up of taking an oil locomotive order at a loss in order to " get in," and reap a problematical harvest when the tide turns.

On the north lines the Siamese 1,500 b.h.p. goods locomotive is running in competition with the 2–8–2+2–8–2 " Garratts." At the full normal rating the rail horse-power approximates to that of the steam machines, which have shown their ability to maintain 1,100 r.h.p. at speeds up to the maximum allowed, viz., 28 m.p.h. Considering that both passenger and goods locomotives possess a double power plant, the values for unit weight (Table I.) may be reckoned satisfactory, but in each case the bogie wheels are loaded to over 85 per cent of the driving wheel load. Roller bearings are fitted to all boxes.

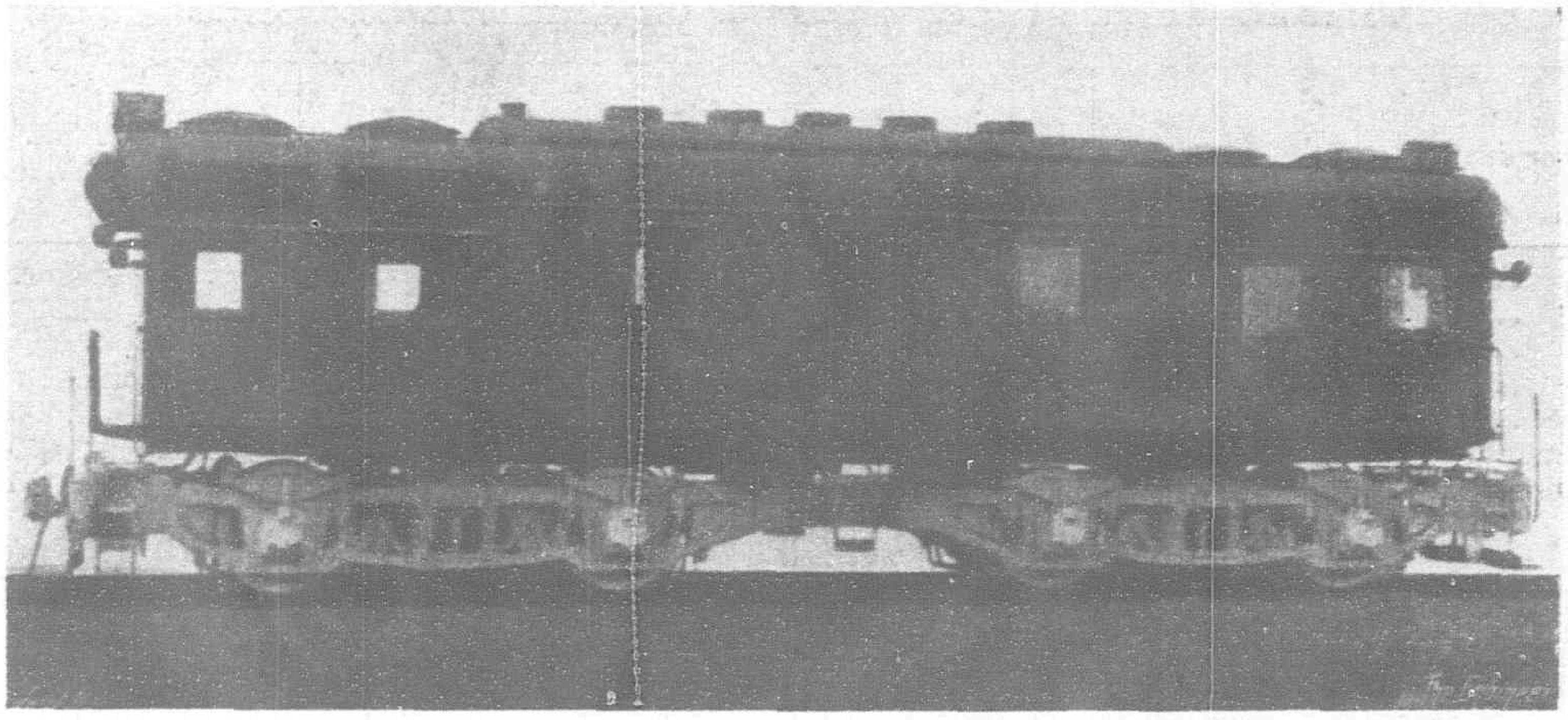

Fig. 5.—American Shunting Locomotive

Denmark

The two 4-8-4 locomotives of the Danish State Railways have prime movers the same as those of the Siamese express units, but, despite a greater permissible axle load, it has not been found possible to reduce the number of axles. Consequently, the unit weight is a little higher than the value for the Oriental machines, although showing a great improvement on the earlier 450 b.h.p. locomotives of the Danish State Railways. These units have been in service barely twelve months, but already the results have confirmed the five years' successful work of the 200 to 450 b.h.p. locomotives, and the State Railways' officials have announced that no further steam locomotives will be built. At the present time Frichs have in hand, or have just completed, twenty-five oil-electric locomotives for various Danish lines, the total b.h.p. being over 6,600.

France and Switzerland

Elsewhere on the Continent, the Ceinture Railway of Paris is putting into traffic a 2-8-2 locomotive. As the tractive effort is sufficient to start a 475 ton train on a 1 in 80 gradient, it is presumably intended for goods working, and pulling International trains round from one terminus to another, and not to run in competition with those curious 4-6-0 tandem-compound tanks which haul the light passenger trains. The eight-cylinder Sulzer engine is rated at 800 b.h.p., evidence of a brightening up following the tests of the Russian 1,500 b.h.p. locomotive, for the engine is that normally rated at 750 b.h.p.

For many years these engines have been rated at the absurdly low brake M.E.P. of 66 lb. to 68 lb. per square inch, but recent tests have demonstrated their ability to work almost continuously at a power some 12 per cent above the rating without any change in design. No evidence is forthcoming that this "easy yoke" has made them more reliable than certain other makes of lesser weight and higher pressures, and in the matter of fuel consumption the comparative tests on the South Manchurian Railway have shown them up to advantage only under full load conditions. As locomotives usually work a good way below this rating, an engine is required which will be economical at high fractional loads.

Over 35 miles out and home of level lines, the power developed on these Manchurian trials was 60 to 65 per cent of the rating, the Sulzer engine showing a consumption of 0.554 lb. per b.h.p. hour, and the M.A.N. unit 0.498 lb. Trailing loads averaged 640 tons, and the speed 16 to 18 m.p.h., the top value being 32 m.p.h. The Sulzer locomotive labors under the disadvantage of eight tons extra

TABLE I.—LEADING CHARACTERISTICS OF RECENT OIL-ELECTRIC LOCOMOTIVES

No. off	*First built*	*Railway or owners*	*Gauge*	*Service*	*Wheel arrangement*	*Engine b.h.p.*	*Engine r.p.m.*	*Max. T.E., lb.*	*Max. speed, m.p.h.*	*Weight in working order, tons*	*Weight per b.h.p., lb.*
1	1930	Danish State	4′ 8½″	Passenger	A2–1A	450[1]	600	?	?	58.5	291
5	1930	U.S.A. (various)	4′ 8½″	Shunting	B°–B°	400	900	42,000	40	62	350
2	1930	Canadian National	4′ 8½″	Shunting	B°–B°	400	900	42,000	40	62	350
1	1930	Westinghouse Company	4′ 8½″	Shunting	B°–B°	800[2]	900	66,000	45	98	275
1	1930	Baldwin Locomotive Works ..	4′ 8½″	Shunting	B°+B°	1,000[3]	500	76,500	25	120	268
2	1930	N.W.R. (India)	5′ 6″	Light passenger	B°–B°	350	900	10,250	60	48	370
45	1930	New York Central, Ill. Cent., and D.L.W.	4′ 8½″	Shunting	B°–B°	300[4]	550	60,000	28	114	850[5]
1	1930	C.M. St. P. and Pacific	4′ 8½″	Shunting	D°	600[2]	?	48,000	25	71.5	267
1	1931	South Manchurian	4′ 8½″	Shunting and goods	B°–B°	750	650	35,700	37	80.5	240
1	1931	South Manchurian	4′ 8½″	Shunting and goods	B°–B°	700	700	35,700	37	72.45	232
3	1931	U.S.S.R.	5′ 0″	Goods	1–D°–0	600	700	46,000	34	93.5	350
1	1931	U.S.S.R.	5′ 0″	Goods	1–D–1	600	700	35,250	31	97.5	364
1	1931	Switzerland	4′ 8½″	Mixed	1–C°–1	700[3]	800	?	?	64	205
1	1931	Siamese State	Meter	Heavy goods	2–D°–D°–2	1,500[2]	600	63,000	28	124	185
6	1931	Siamese State	Meter	Express passenger	2–D°–2	1,000[2]	600	32,000	42	85	189
6	1931	Siamese State	Meter	Mixed	A1A–A1A	450	700	20,700	42	59	294
2	1931	Danish State	4′ 8½″	Express passenger	2–D°–2	1,000[2]	600	37,500	70	100	224
1	1931	Denmark (private)	4′ 8½″	Passenger	A1–1A	350	600	?	37	43	276
1	1931	Consolidated Diamond Mines ..	2′ 0″	Goods	A1A–A1A	300[6]	700	?	22	55	411
3	1931	Port óf Rosario	5′ 6″	Shunting	B°–B°	330	700	30,800	28	57.5	390
7	1931	Bush Terminal	4′ 8½″	Shunting	B°–B°	300	550	30,000	28	53.5[8]	400
1	1931	Erie R.R.	4′ 8½″	Shunting	B°–B°	800	550	57,000	25	102.5	288
1	1932	U.S.S.R.	5′ 0″	Heavy goods	2–E°–1	1,200	400	44,100	34	135	252
1	1932	U.S.S.R.	5′ 0″	Heavy goods	2–E°–1	1,500[2]	650	57,200	37	144.3	216
9	1932	Japanese Government	3′ 6″	Shunting and goods	1–C°–1	600	700	24,000	37	60	224
1	1932	Armstrong-Whitworth	4′ 8½″	Shunting	C	250	775	24,000	30	40	358
1	1932	P.L.M.	4′ 8½″	Shunting	B°–B°	750	650	?	34	?	?
1	1932	P.L.M.	4′ 8½″	Shunting	B°–B°	600	700	?	34	71.5	268
2	1932	Denmark (private)	4′ 8½″	Light passenger	1–A1A–1	330	650	?	46	44	299
6	1932	Denmark (private)	4′ 8½″	Light passenger	1–C°–1	415	600	16,000	50	43	232
1	1932	Ceinture (Paris)	4′ 8½″	Mixed	1–D°–1	800	700	28,000	?	84.5	237
3	1932	B.A.G.S.R. (Argentine)	5′ 6″	Suburban passenger[7]	1A–2+2–A1	1,700[2]	550	—	56	130	171
1	1932	B.A.G.S.R. (Argentine)	5′ 6″	Passenger and goods	1A–B°+B°–A1	1,700[2]	550	35,000 66,000	70 40	148	195
1	U.C.	Armstrong-Whitworth	4′ 8½″	Mixed	1–C°–1	800	700	22,000	65	73	205
3	1932	Ford Works	4′ 8½″	Shunting	B°–B°	150	550	?	?	40	600
10	U.C.	U.S.S.R.	5′ 0″	Heavy goods	2–E°–1	1,200	400	44,100	34	133	250

[1] Two-cycle engine. [2] Double power plant. [3] Supercharged. [4] Oil-electric battery locomotive, 1600 h.p. ext. supply. [5] On basis of engine power. [6] Overhead line also. [7] Mobile power-house. [8] Mech. portion all-welded.

TABLE II.—LEADING CHARACTERISTICS OF OIL-MECHANICAL LOCOMOTIVES

No. off	*First built*	*Railway or owners*	*Gauge*	*Service*	*Wheel arrangement*	*Engine b.h.p.*	*Engine r.p.m.*	*Max. T.E., lb.*	*Max. speed, m.p.h.*	*Weight in working order, tons*	*Weight per b.h.p., lb.*
1	1925	U.S.S.R.	5′ 0″	Heavy goods	2–E–1	1,200	450	43,000	31	129	241
2	1927	Siamese State	Meter	Shunting	B	200	500	11,500	25	23.5	263
1	1929	B. San Paulo	Meter	Shunting	B	150	900	9,240	15	17.3	258
1	1929	Junin (Chile)	2′ 6″	Shunting	1–C–1	330	1,000	?	?	32	218
1	1931	Boston and Maine	4′ 8½″	Freight	2–D–2	[1]1,450[2]	470	50,000	?	145.5	225
1	1931	Japanese Government	3′ 6″	Shunting	1–C–1	600[1]	540	26,400	37	65.5	244
1	1931	Japanese Government	3′ 6″	Shunting	B	150	900	14,520	9.5	33	493
1	1931	Hudswell-Clarke	4′ 8½″	Shunting	C	150	900	9,570	30	19	284
1	1932	U.S.S.R.	5′ 0″	Shunting and goods	B	300	700	22,000	22.6	37.5	280
1	1932	Morocco	600 mm.	Mixed	1–C–1	150	900	8,150	16	18.6	278
1	1932	L.M.S.R.[3]	4′ 8½″	Shunting	1–C–1	400	750	?	25	46.1	258

1 Supercharged. 2 Rated power not yet developed. 3 Hydraulic transmission.

weight without any corresponding gain in tractive effort. Special tests to determine the fuel consumption at various outputs gave the following figures :—

	Fuel Cons., lb. per B.H.P. hour. *Sulzer*	*M.A.N.*
Full load	0.390	0.401
75 per cent	0.399	0.390
50 per cent	0.448	0.410
25 per cent	0.618	0.502

The P.L.M. locomotives, one of which incorporates an M.A.N. engine, and the other a Sulzer, are understood to have been delivered, but no particulars are available. Experiments on the 2–6–2 supercharged locomotive in Switzerland still continue. Results are not known, but in power-weight characteristics the machine shows some startling figures. Developing, with a Büchi supercharger, 700 b.h.p. at 800 r.p.m., the engine is of the six-cylinder four-stroke type, using air injection, and together with its auxiliary equipment, weighs 38 lb. per b.h.p. By some means or other, not yet divulged, the electrical transmission, including three nose-suspended motors, has been brought down to 48 lb. per b.h.p., against the 60 lb. to 80 lb. of recent normal designs.

America

Delivery of the Boston and Maine oil-mechanical locomotive, ordered in Germany five years ago, has not yet been effected. In the earlier stages the unfamiliarity of Continental builders with American locomotive details occasioned some delay, but the root of the trouble is that the stipulated brake horse-power of 1,450 has not yet been obtained, despite the inclusion of a supercharger. Several trips have been made within the last seven or eight months, and have apparently been successful within the reduced power limit.

It may be asked of what use is 1,450 b.h.p. on an American railway, and this question certainly reiterates the doubts expressed as to the utility of the New York Central 800 and 900 b.h.p. locomotives. The United States has lately slowed up in the production of new designs, but the problem of a high-power locomotive to suit the peculiar conditions will soon have to be tackled, and something vastly in advance of the present-day oil engine will be found necessary.

The 1,000 b.h.p. Baldwin-Krupp locomotive (Fig. 5) has covered over 15,000 miles in yard and local freight service on six roads and in open mine haulage, the total working period being some 4,000 hours. The supercharger, which is similar to those included in the Japanese and Boston and Maine locomotives, and which works at a normal pressure of 6 lb. per square inch, has not been free from maintenance trouble. After 2,500 hours' operation, the main engine was opened up, and the wear on the cylinder liners found to be 0.003-in. This is much greater than in the Ingersoll-Rand 300 b.h.p. engines, the wear in which has averaged from 0.002-in. to 0.0045-in. per 10,000 hours' service, although the percentage of time on full load is probably greater. The high liner wear of the Krupp engine may be due to lack of lubrication, as the figures given for the lubricating oil consumption are suspiciously low at 0.81 gallons per 2,000 horse-power hours, or only 0.8 per cent of the fuel consumption of 0.465 lb. per b.h.p. hour.

Great Britain

The British firm which, two years ago, wedded itself solely to electric transmission, has now a couple of rivals. The 250 b.h.p. shunting locomotive built by Armstrong-Whitworth in the first four months of its service in various L. and N.E.R. goods yards put in 2,265 hours of work. The single motor rod-drive of this machine has been given up in favor of nose-suspended motors in the 800 b.h.p. unit under construction at the works of the same builders. Intended more or less for mixed traffic work, the designers have done well to avoid the double-bogie lay-out, and if the final weight comes out anywhere near the anticipated figure of 73 tons, quite a good power-weight ratio will result. The main particulars of the Argentine 1,700 b.h.p. mobile power-houses and locomotive, the first of which has just been shipped to Buenos Aires, will be found in Table I. The three B.T.H.-Allen-Metro-Vick locomotives for the Ford works are now completed, but their power is too small and their dimensions too large for any problems to arise in operating or design. The only remaining oil-electric activity of any note is the 270 b.h.p. Harland-Burmeister two-cycle mixed traffic locomotive, now in the first stages of construction for the Belfast and County Down Railway.

Leading particulars of the various geared locomotives constructed since 1924 are given in Table II., but there may be chronicled the advent on the L.M.S. of a 400 b.h.p. hydraulic-drive 2–6–2 shunting locomotive, whose characteristics are, for convenience, included in Table II. In view of the invariable failure of the many preceding hydraulic units, the operating results of this machine will be awaited with much interest.

Manchoukuo's Commercial Possibilities

(Continued from page 300)

spite of the lack of formal recognition of Manchoukuo, it is not too early to consider the sending of a British Trade Mission there. I personally asked Mr. Matsuoka, formerly Japanese delegate to the League of Nations, recently, if such a mission would be welcomed. He cordially supported the idea, and suggested the summer of this year as a suitable time. The Manchoukuo budget is coming up for consideration shortly and after that, Mr. Matsuoka thought, the moment would be most opportune. It must be remembered that the terribly depreciated currency of Manchoukuo is a thing of the past. The Government bank is buying up all the old depreciated notes at their market value and burning them. The new notes are properly secured on a silver basis and stand at or above par in Shanghai markets. A serious attempt is being made to liquidate old debts on the basis of 25 per cent in cash, 25 per cent in a year's time, and the balance in the form of Government paper. The foreign creditors of China proper would be only too glad to see such a scheme initiated, and it is a feather in Manchoukuo's cap that there the repayment of outstanding debts has become a matter of practical politics. Finally, efforts are being made to establish a trade agency in London for Manchoukuo, and considerable interest is being shown in this development by those best qualified to estimate its value.

Iron Ore Resources of the U.S.S.R.[*]

SINCE iron and steel constitute the most vital prerequisites for the development of heavy industry, adequate reserves of iron ore within the U.S.S.R. are naturally of paramount importance for the successful carrying out of the industrialization program, which lies at the basis of the present and Second Five-Year Plans. Fortunately, the Soviet Union has ample stores of this mineral. Indeed, as a result of intensive geological surveys carried on during the last few years, it is now believed that the U.S.S.R. not only holds first place in iron ore resources but that its deposits probably exceed those of all of the rest of the world combined.

The world's supply of iron ore was estimated in 1926 by an American authority, O. R. Kuhn, at 243.4 billion metric tons, of which 65.8 billion tons were classed as commercially exploitable. Of the total the share of the Soviet Union (excluding the Kursk magnetic anomaly and the Krivoy Rog iron ore quartzites, which at that time had not yet been subjected to careful surveys) was estimated at three billion tons, or 1.2 per cent. With the inclusion of the Kursk and Krivoy Rog quartzites, as preliminarily estimated in 1926-27, the Soviet total rose to 37 billion tons, or 16 per cent of the world figure. Since these estimates were made geological research work in the U.S.S.R. has developed at a rapid rate, the number of surveying parties in the field in 1931 totaling over 2,000. On the basis of these recent extensive geological surveys the known iron ore reserves in the Soviet Union, exclusive of Kursk and the Krivoy Rog quartzites, were estimated this spring by the noted Soviet geologist, Academician I. M. Gubkin, at 8.5 billion tons. Of this total over two billion tons have been intensively surveyed and are considered commercially exploitable. Recent surveys of the deposits in the Kursk magnetic anomaly have led Prof. Gubkin to believe that it alone may contain over 200 billion tons of ore, or nearly as much as the 1926 world total.

While the Kursk district will no doubt eventually be one of the principal metallurgical centers of the U.S.S.R., the Soviet Union at present depends and during the coming five-year period will depend chiefly upon the two great metallurgical bases now under exploitation—Southern Ukraine and Ural-Kuznetz. The former has been the chief metal-producing section, the rich deposits of the Urals and Siberia having until recently been left comparatively undeveloped. The Krivoy Rog district in the Ukraine has supplied over three-fifths of the iron ore output of the Soviet Union, and during the Second Five-Year Plan this district will still be the chief source of Soviet iron ore. However, by the end of the five-year period (1937) it is expected that it will yield first place to the second metallurgical base of the U.S.S.R., the Ural-Kuznetz combine.

Krivoy Rog and Kerch Ores

The deposits at Krivoy Rog are estimated at over 700 million tons, of which 211 million tons are classed as commercial. The Krivoy Rog ore is of the red hematite type and of exceptionally high quality, with an iron content up to 66 per cent and over. In addition to the above deposits, there are at Krivoy Rog extensive quartzite deposits, totaling from 20 to 40 billion tons, of which at least 10 billion tons contain from 40 to 45 per cent iron, sufficient for industrial utilization.

According to Mr. R. C. Allen, President of the Lake Superior Iron Ore Association and Vice-President of Oglebay, Norton and Co., a mining concern which furnished technical assistance in developing Soviet iron ore deposits, Krivoy Rog ores are "on the average richer than old range Lake Superior ores." He states further that these deposits "could produce from known ore bodies 25,000,000 to 30,000,000 tons of high-grade ore per year, without extending the known productive limits of the range and without resort to concentration of low grades."[†]

In addition to the rich ores of Krivoy Rog the southern Soviet steel mills can draw upon another vast store of raw material as yet almost untouched—the Kerch deposits in the Crimea. Here lie deposits of brown ore estimated at 2.5 billion tons, of which 1.5 billion are in the commercial categories. Due to their low grade (30 to 40 per cent iron content, 15 to 22 per cent silica), their use was formerly considered unprofitable. However, recent experiments in the concentration of Kerch ores have proved successful, and the commercial utilization of these ores will be commenced in the near future. It is expected that within a few years as much as one-fourth of the pig-iron output of the southern steel mills will be produced from Kerch ore.

The Ural-Kuznetz Deposits

The ore deposits in the Urals are scattered from the extreme north to the very south of the range, and they vary both in quantity and quality, including magnetites, hematites, limonites, etc. The reserves are estimated at 1.6 billion tons, and those in the commercial categories at about 500 million tons. Only about 23 per cent of the latter is fit for immediate smelting; the remainder requires a considerable degree of concentrating. Of the total reserves the southern Urals furnish approximately one billion tons, or 60 per cent, the Central Urals 550 million tons, or 35 per cent, and the northern Urals, 56 million tons or 5 per cent. The deposits of the southern group include not only those in the Ural Region proper but those of Bashkiria and of the Orsk-Khalilovo district in the Middle Volga Region. The iron ore deposits in the Orsk-Khalilovo district, discovered in 1855 but not intensively explored until 1930, are estimated at 500 million tons. Of this total about 100 million tons belong to the commercial categories and can be mined without great expenditure, the ore lying near the surface. Preliminary construction work is under way for a steel mill near Orsk, to be completed in 1934. At present the largest Ural deposits under exploitation are those at Magnitnaya or Magnet Mountain. These cover an area about 2,300 meters long and 1,000 meters wide, and contain from 360 to 375 million tons of ore, with an iron content of from 60 to 62 per cent. The ore from these deposits was first mined in 1929 and now constitutes the chief supply for the furnaces of the two new giant steel mills of the Ural-Kuznetz combine—Magnitogorsk (Ural Region) and Stalinsk, formerly Kuznetz (West Siberian Region).

The transportation of Magnitnaya ore to Stalinsk, a distance of about 1,200 miles, was necessitated by the fact that the total known deposits of ore in West Siberia amounted in 1931 to only 56 million tons and those in the commercial categories to only 26 million tons. Recent geological surveys, however, have revealed several new deposits in the Gorno-Shori district (about 125 miles from Stalinsk), estimated to contain from 200 to 300 million tons of iron ore. Two deposits in this district are already being exploited—Telbes and Temir-Tau. The deposits of the Gorno-Shori iron ore district alone are now considered fully adequate to supply three or four large steel plants of the size of the Stalinsk mill. The development of such an iron ore base in the Kuznetz Basin will simplify immensely the transportation problem of the Ural-Kuznetz combine.

Kursk Magnetic Anomaly

The recent surveys of the iron ore deposits of the Kursk magnetic anomaly (Central Black Soil Region), which indicate that they contain not tens of millions of tons of ore as originally estimated but over 200 billion tons, have led to the selection of this section as the third great metallurgical base of the Soviet Union. It is Professor Gubkin's conviction that it will eventually become one of the most important metallurgical centers of the entire world.

The Kursk magnetic anomaly, the largest in the world, was discovered in 1874, but it was not until about 1925 that deep drilling carried on by a special geological party under the Supreme Economic Council revealed the presence of immense iron ore deposits at a depth of from 120 to 150 meters. Extensive drilling work, however, was not undertaken until last year. The recent surveys indicate that a greater share of these deposits than was hitherto supposed consists of high-grade ore, similar in structure and quality to the famous deposits at Krivoy Rog. Thus, in a report by Professor Gubkin made in August of last year he describes three areas (Korobkovo, Saltykovo, and Lebeda), which alone contain about 140 million tons of commercial deposits, largely of high quality ore, hematite type, and with an iron content ranging from 45 to 65 per cent. Other portions of the Kursk anomaly also give signs of rich ores, but these have not yet been thoroughly explored. Besides the rich ores the Kursk deposits contain enormous quantities of ordinary quartzite, much of which has an iron content of from 45 to 50 per cent, similar to the rich quartzites of Krivoy Rog which are considered suitable for industrial exploitation

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[*] *Economic Review of the Soviet Union.*

[†] *Steel*—April 18, 1932.

The location of the Kursk deposits, in the center of the European portion of the U.S.S.R. and about midway between the Moscow and Donetz coal basins, is most favorable. Work leading to the exploitation of these deposits is now under way. The sinking of the first shaft for the first mine was started last August and that of the second shaft shortly after. The capacity of the mine is set at 500,000 tons of ore a year.

East Siberia

The iron ore reserves of East Siberia have only begun to be studied. Surveys up to February 1932 indicated total iron ore reserves in East Siberia of over 500 million tons, of which about 400 million tons were in the immediate vicinity of the Irkutsk coal basin and the sites of the future Angara River power plants. More than half of these deposits were composed of low-grade ore (35 to 40 per cent iron). In August last year a new deposit of iron ore was discovered in the Trans-Baikal district near the Petrov steel mill. The deposit is estimated to contain over 100 million tons of ore, sufficient to supply the Petrov plant for a period of fifty years. An even more recent discovery, reported in the Soviet press of September 11, has revealed in the Nizhni-Ilim district, near Irkutsk, a rich ore zone similar to the Magnitnaya deposits and containing, according to preliminary estimates, 300 million tons of ore. The deposits are over two kilometers in length and 100 meters in width. The iron content of the ore is 60 per cent. The plenteous supply of iron ore, as revealed by these new discoveries, the coal of the Irkutsk, Kansk, and Tungus basins, the water power of the Angara River, and a number of other favorable factors offer the necessary prerequisites for building up a great iron and steel industry in this region. In fact, East Siberia is now considered the logical site for the fourth great metallurgical center of the U.S.S.R.

Miscellaneous Deposits

Districts of secondary importance as regards iron ore reserves include Tula (Moscow Region), Lipetsk (Central Black Soil Region), and Khoper (Lower Volga Region) districts, Kazakstan, the Caucasus, the Soviet Far East, the Kola Peninsula and other regions of the Soviet Far North. While in most cases these deposits are not large enough to serve as a basis for an iron and steel industry of any great magnitude, their development is important to serve local needs. Thus, the exploitation of the Caucasus deposits would serve to supply the metal requirements of the local oil industry, and that of the northern deposits the needs of the growing machine-building industry of Leningrad.

Extensive prospecting work is being carried on throughout the entire country, and the Soviet press carries reports almost daily of the discovery of new deposits in one or another section. In many regions, especially of the Asiatic portion of the Soviet Union, only a bare beginning has been made toward investigating the iron ore resources. It seems probable that the total reserves are many times as great as the present known deposits.

Growth in Output of Iron Ore

As a result of the civil war and intervention the extraction of iron ore dropped to practically nothing in the years 1920- 1922. The pre-war level was reached in 1930, and last year was exceeded by 18.4 per cent. The growth in output from year to year is shown in the following table:

(thous. metric tons)

1913	9,210.0	1927	5,018.8
1921	129.1	1928	6,024.4
1922	244.6	1929	7,848.7
1923	505.7	1930	10,424.6
1924	1,096.3	1931	10,900.0
1925	2,189.8	1932 (4 mos.)	3,993.2
1926	3,486.7		

Exports of iron ore during recent years, as compared with 1913, have been as follows:

(thous. metric tons)

1913	469.7
1928	479.7
1929	545.2
1930	466.6
1931	1,119.1

With its vast reserves of iron ore the Soviet Union has a firm foundation upon which to build up its iron ore output. By the reconstruction and mechanization of existing mines, by the solution of the problem of the utilization of quartzites and other lower grade ores, and by bringing under exploitation the many new deposits (Kursk, Khalilovo, Gorno-Shori, Nizhni Ilim, and numerous smaller ones) it is expected that during the coming five-year period output of iron ore will be adequate not only to meet the growing domestic demand but to supply an increasing amount for export.

Minerals in Malaya

Minerals produced in Malaya include arsenic, coal, iron, manganese, schelite, tin and wolfram, with phosphate of lime from Christmas Island. The smelting works at Singapore and Penang produce more than half the world's supply of metallic tin, with ore predominantly from British Empire sources. An international scheme between Malaya, the Netherlands Indies, Nigeria and Bolivia to control the production and export of tin, was inaugurated on March 1, 1931, Siam joining in September. The quota for the half year ending August 31, was 75 per cent and thereafter 40 per cent the object being to reduce the world's output from the neighborhood of 190,000 tons to a potential production of 109,800 tons or a level approximate with consumption. At the end of the first year of working exports from participant countries were 440 tons under their quotas, which was satisfactory. Prices were, in sterling per ton, highest £144 17s. 6d. in December, lowest £102 in June, and average £120. 6s. 8d.

Domestic production of tin at 72 per cent of ore amounted to 52,642 tons as compared with 63,980 tons in 1930, a reduction of 17.7 per cent. This production represented 37 per cent of world output, and of it 56,642 tons or 97 per cent came from Federated Malay States, 1,377 tons from the Unfederated Malay States and 15 tons (as compared with five tons in 1930) from Malacca.

Imports of tin-in-ore at the same percentage amounted to 31,369 tons valued at $30 millions on 22 per cent of world output, as compared with 20 per cent the previous year, coming principally from the Dutch East Indies and from a range of countries including Siam, Burma, Indo-China, Alaska, Australia, China, Japan, Tanganyika and the Union of South Africa.

Exports of the metal fell from 97,000 tons to 84,000 tons showing decrease to all destinations except to the United Kingdom and Japan. The declared value amounted to $83 millions or £9,739,000. Fifty-nine per cent went to the United States of America, 19 per cent to the Continent of Europe, 14 per cent to the United Kingdom, five per cent to British Possessions, two per cent to Japan and the balance one per cent to other countries.

Constituted reserves at the end of 1931 amounted to 5,880,000 acres or 9,187 square miles or 18 per cent of the area of Malaya.—*Malayan Tin and Rubber Journal.*

After Twenty-One Years

Impressions of Chinese Engineering Graduates and Undergraduates at the University of Hongkong

By Professor C. A. MIDDLETON SMITH, M.Sc., M.I.Mech.E. (Dean, Faculty of Engineering and Taikoo Professor of Engineering in the University of Hongkong)

ALTHOUGH the University of Hongkong was opened, officially, by Sir Frederick (now Lord) Lugard in 1912, the first entry of students commenced their academic training in the following October.

In May, 1912, an unexpected cable from Hongkong reached me in London. It offered me the appointment of Professor of Engineering in the new University. After a consultation with Sir Alfred Ewing, F.R.S.—one of the first English technical Professors in Japan, and in 1912 Director of Naval Education—the decision was made to reply with a counter offer which was accepted.

Incidentally it may be mentioned that last year Sir Alfred Ewing was President of the British Association for the Advancement of Science, a very high honor shared with the Prince of Wales and the most notable scientists in Britain. He retains many Japanese friends. He was in charge of "the Mystery room" at the British Admiralty during the war—the room where the enemy secret messages were decoded. Sir Alfred is an engineer with a most facile pen which his technical books and other contributions reveal. And because of his great ability as a teacher of technology he left his mark upon Japan.

Chinese in London

Actually my contact with Chinese undergraduates commenced at King's College, London, in 1905, so that it is possible to claim some twenty-eight years of experience with the type.

In that year Kunpah King and his two brothers came into my life. We had many foreign students in King's College—Greeks, South Americans, Russians, Spaniards, Chinese, Indians, etc.,—but of all the representatives of many races the King brothers were by far the most likeable. They were lodging in a London suburb not far from my bachelor diggings. And as Kunpah was older than me, and as all three were very delightful company, we became very friendly. So much so that they attended my wedding. And, in 1916, when with the late Sir Charles Eliot, I visited Peking for the first time Kunpah heard of my arrival. He did everything possible to make me enjoy the visit. Alas ! he died three or four years ago.

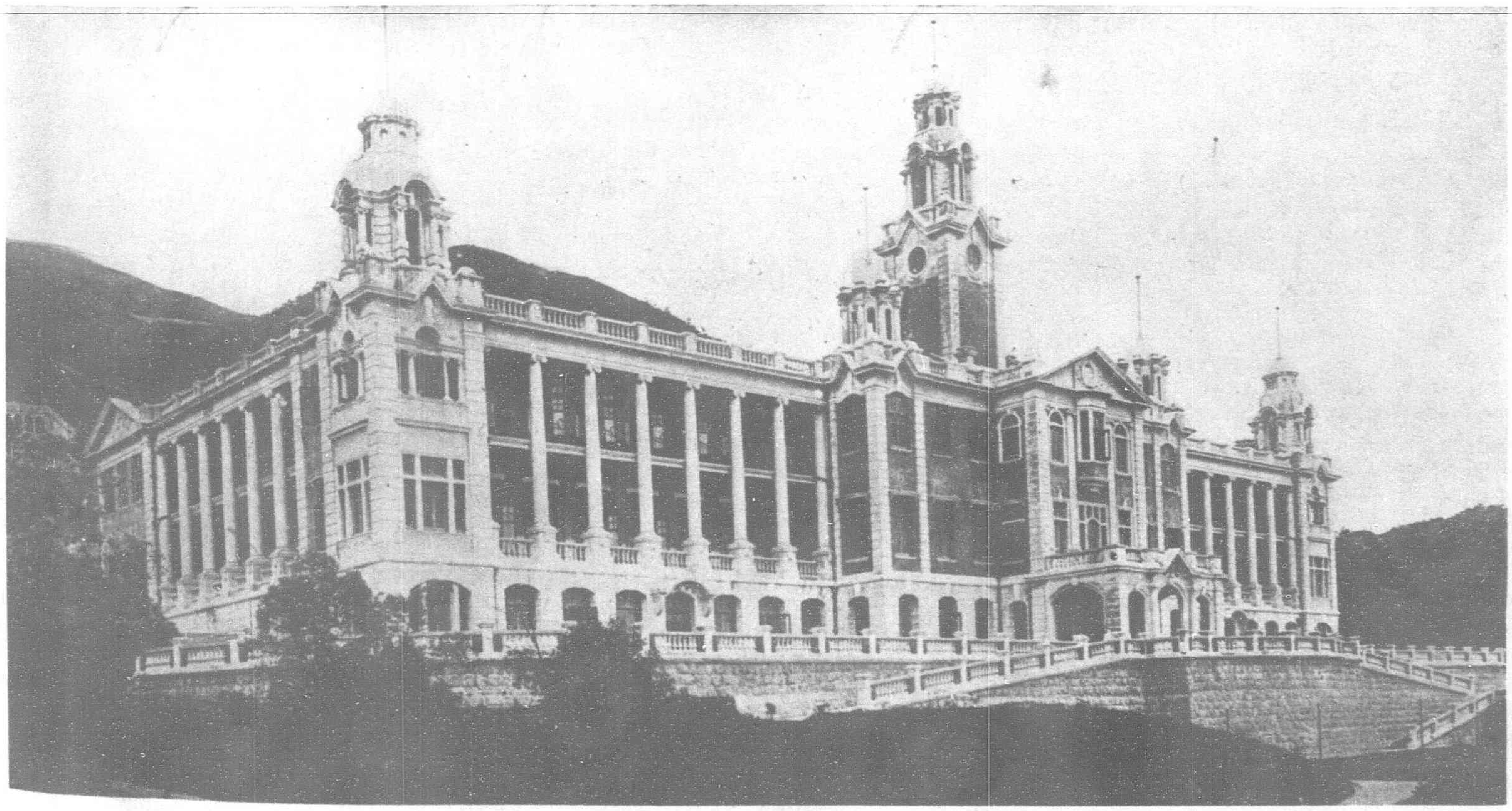
My experience with the King brothers, and other Chinese students in London, must have affected my mind in 1912 when the great decision to leave England for Hongkong was made. For I am quite sure that a similar offer from other places would have been declined. But the Far East seemed attractive if only because of the constant courtesy of the Chinese students in London.

Constant Courtesy

The outstanding impression left upon my mind, after some twenty-eight years of experience with Chinese undergraduates, is their courtesy. It is, perhaps, a little difficult to define "good conduct," but those two words, and the noun "gentleman" come to my mind when the Chinese student is mentioned. During the twenty-one years of the existence of the University of Hongkong there has been only one case brought to my notice of any lack of courtesy on the part of the student body. We all knew that (let us call him) "Lim" was not quite normal. After a couple of years in the University he amazed a Professor—and his fellow students—by standing up and flatly contradicting a statement made in the lecture. The poor fellow was subsequently certified as insane.

Playing the Game

It is, perhaps, all the more remarkable to be able to pay such a tribute to the Chinese undergraduates in Hongkong when we have the newspaper records of the student outrages at Nanking and the stories of insubordination at Canton, Peking and in other centers of College life. Those episodes simply astonish us in Hongkong.

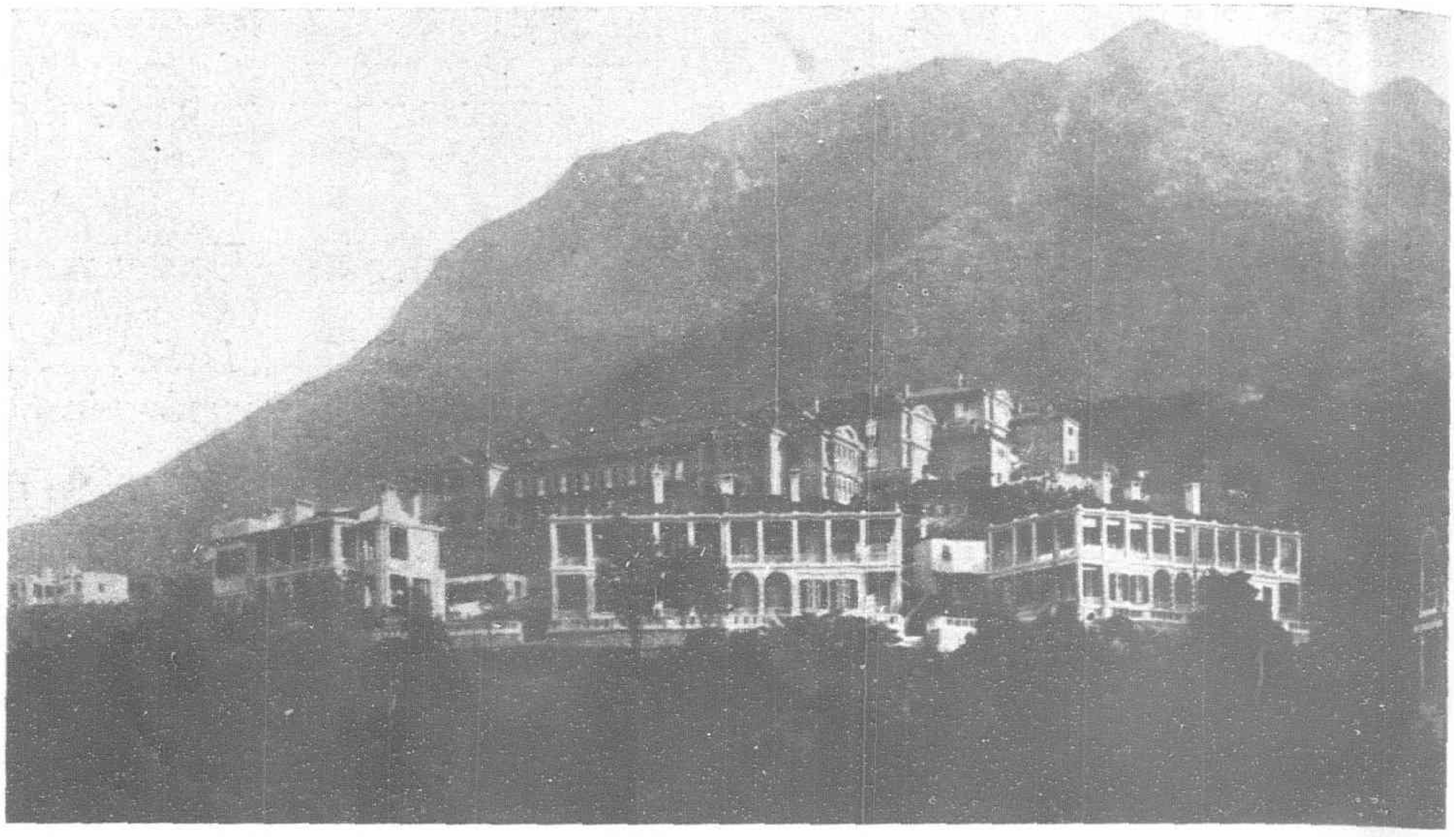


Main building of Hongkong University from a Northern Aspect

During the great excitements of 1922 and 1925, when there were general strikes in the Colony, and all of the servants left Europeans, the Chinese students in the University helped the European staff to maintain supplies and amenities of life. There was never the slightest suggestion of trouble. Of course all lectures and classes had to be suspended for a time because the staff and students had other emergency duties; but the conduct of the latter was all that could be desired.

There has always been a contingent of from fifty to eighty Chinese students from Malaya. On the whole these are of better physique, more athletic and more self-confident than students from China. They are, to put it rather crudely, more like the products of English public schools than are other Chinese students when they enter the University.

It is an interesting speculation as to what had made the difference in type. It might be supposed that young men born and bred near to the equator, would be less active than those from Canton, Shanghai and North China. It is true that many of the Chihli and other students from the North are young men of fine physique—but no better than some from Malaya.



Students' Hostels and some Staff Residences at the University of Hongkong

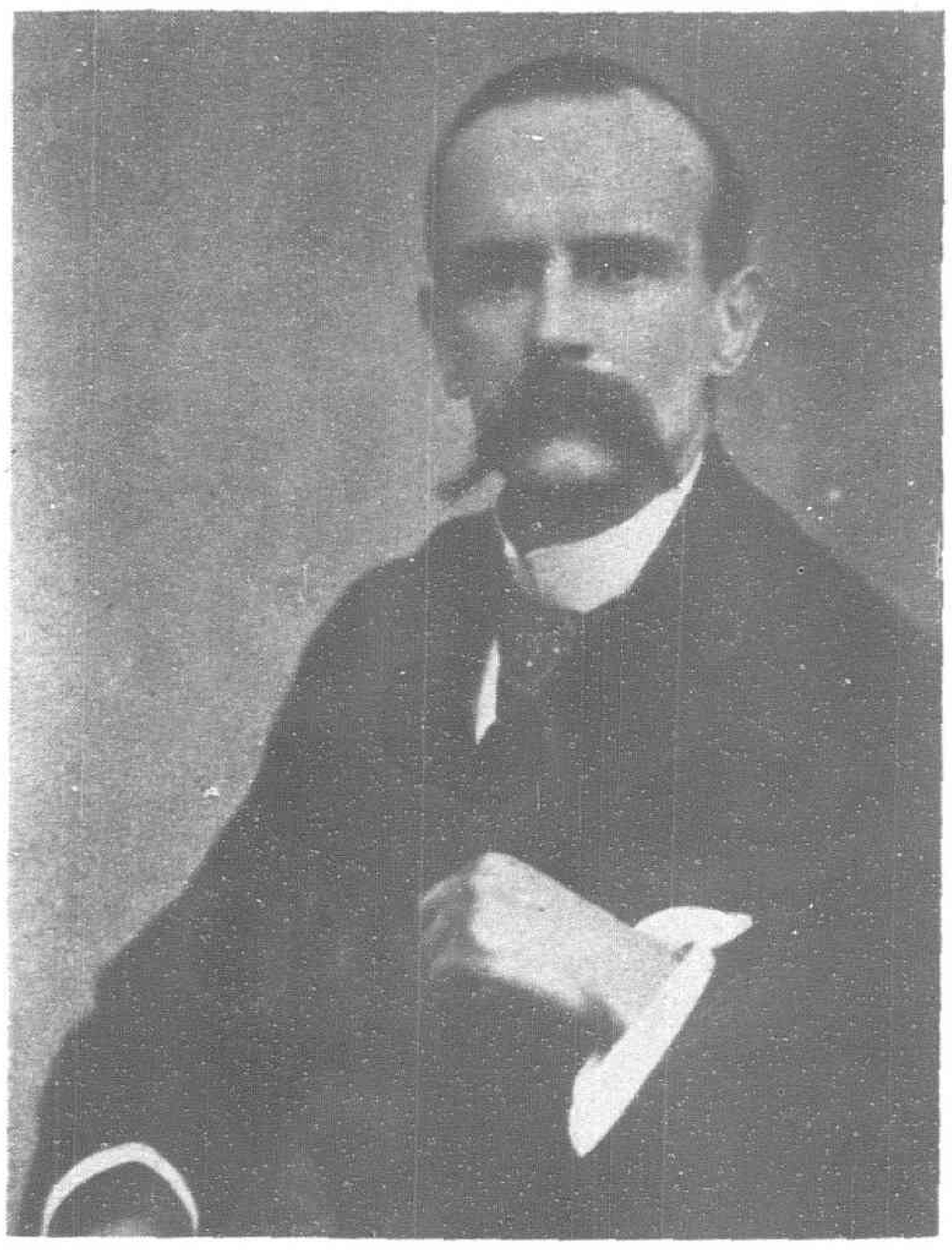
It is probable that in some cases, there is an intermixing of Malay blood with Chinese in students from Singapore, Penang, etc. But the Malay is alleged to dislike work, so that cannot help.

The New Environment

It may be argued that these young men are the offspring of fathers who have won big prizes in the race for the survival of the fittest. In many cases they are only two or three generations removed from indentured Swatow or Amoy coolies.

The most probable cause is environment. The family life of the Chinese with money in Malaya is different to that of Chinese even in Hongkong. For, in this British Colony as in China the family obligations seem to oppress, almost to stultify, youth. He seems to be shut in, hemmed about with duties, harassed by relatives.

It may be an enormous advantage that the family of the ex-coolie in Malaya is a long distance from his native town or village!

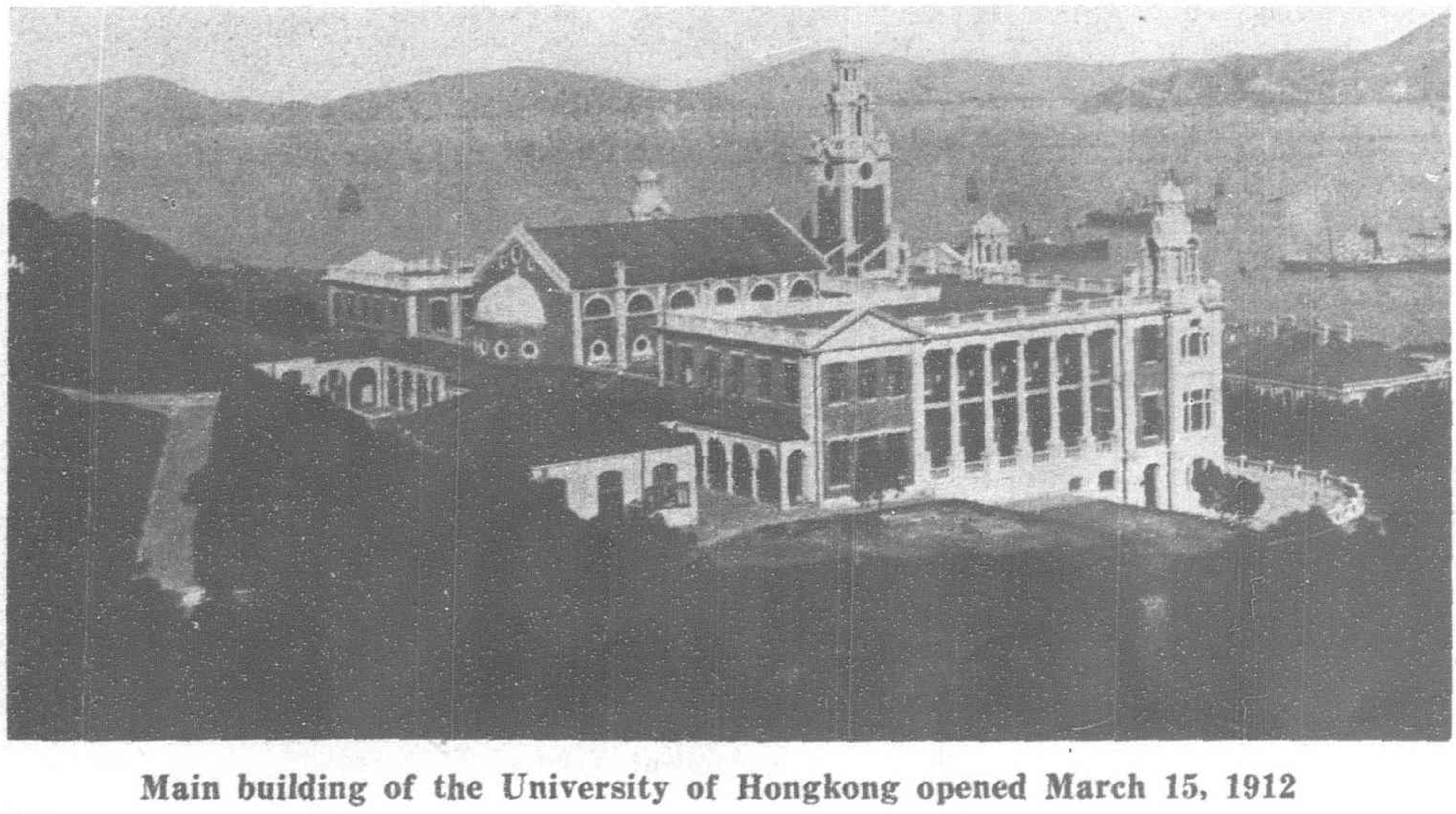


Lord Lugard who Founded the University of Hongkong in 1912

Again, there is not the long memorizing of the Chinese classics to weigh down the mind of the Malayan Chinese. This is no attempt to deprecate the teachings of Confucius, Mencius and other Chinese sages. But it has often puzzled the writer whether this excessive mental burden, this entirely classical education, with its insistence upon intricate details of etiquette, is altogether a blessing to the young Chinese of the twentieth century. It seems to oppress him. It occupies so much space in his mind.

There are, of course, many Englishmen who are convinced of the great superiority of the Chinese classical system over anything that obtains in Europe. It is not unfair to the memory of the late Sir Charles Eliot to say that he was of the opinion that modern science and twentieth century ideas were no blessing to China. He was quite sure that the Golden Age of the country was before there was any contact with Europeans. But then he also thought that England was a much pleasanter place in the pre-steam era than it was after James Watt demonstrated that steam could be made to replace muscular energy.

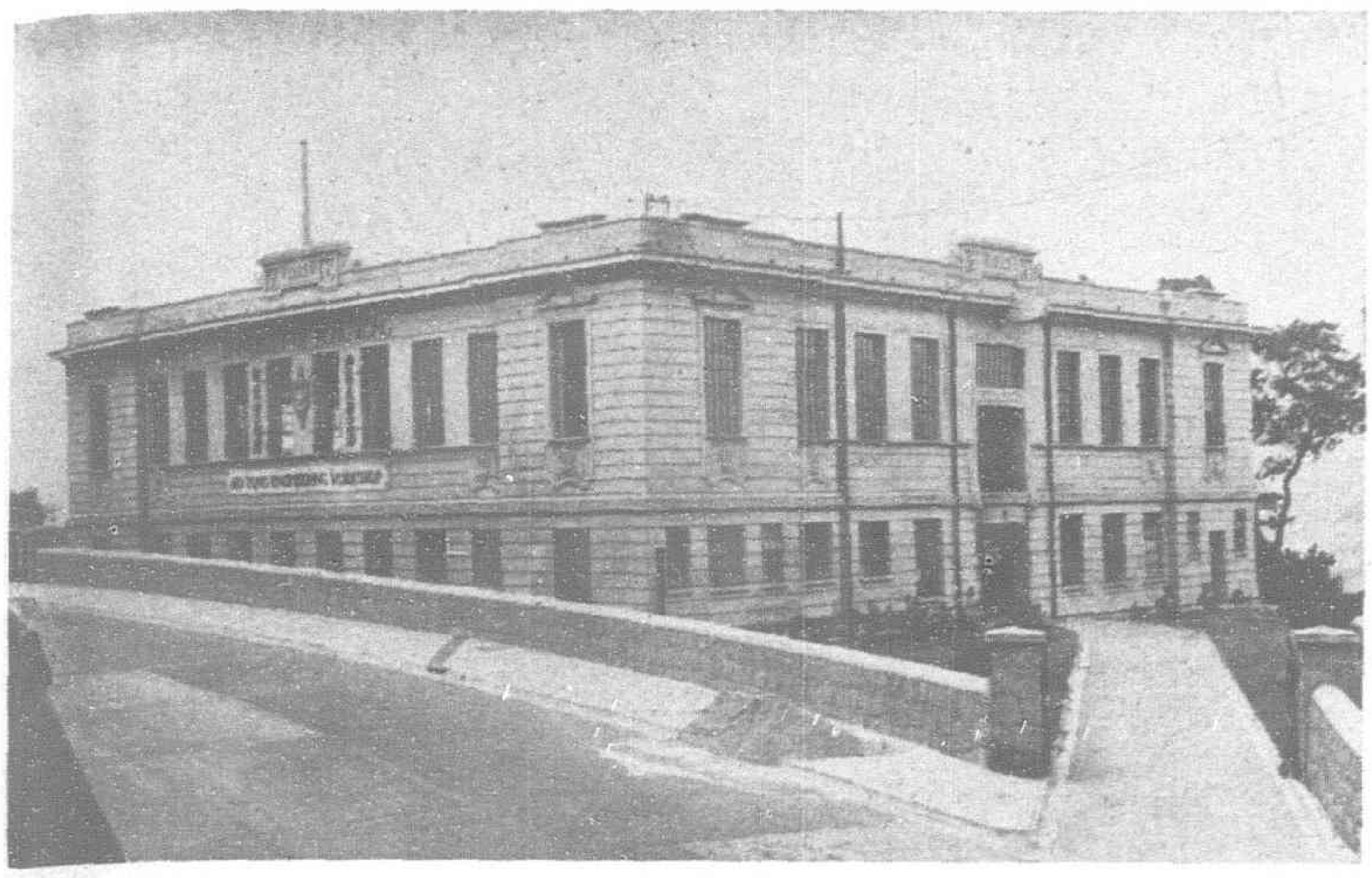
It is, of course, almost useless to argue with men of that type of mind; the Bellocs, the Ghandhis and the other Mrs. Partington's of this century. They confuse causes. They see the slums and read of the "sweating" in the factories of Britain in the nineteenth century, and they do not realize that all of it was due to greed, ignorance, indifference to social obligations and the inefficiency of legislators. And Asia will pass through the same horrors unless there is prevision and suitable legislation to regulate the industrial revolution which has already commenced in this continent.



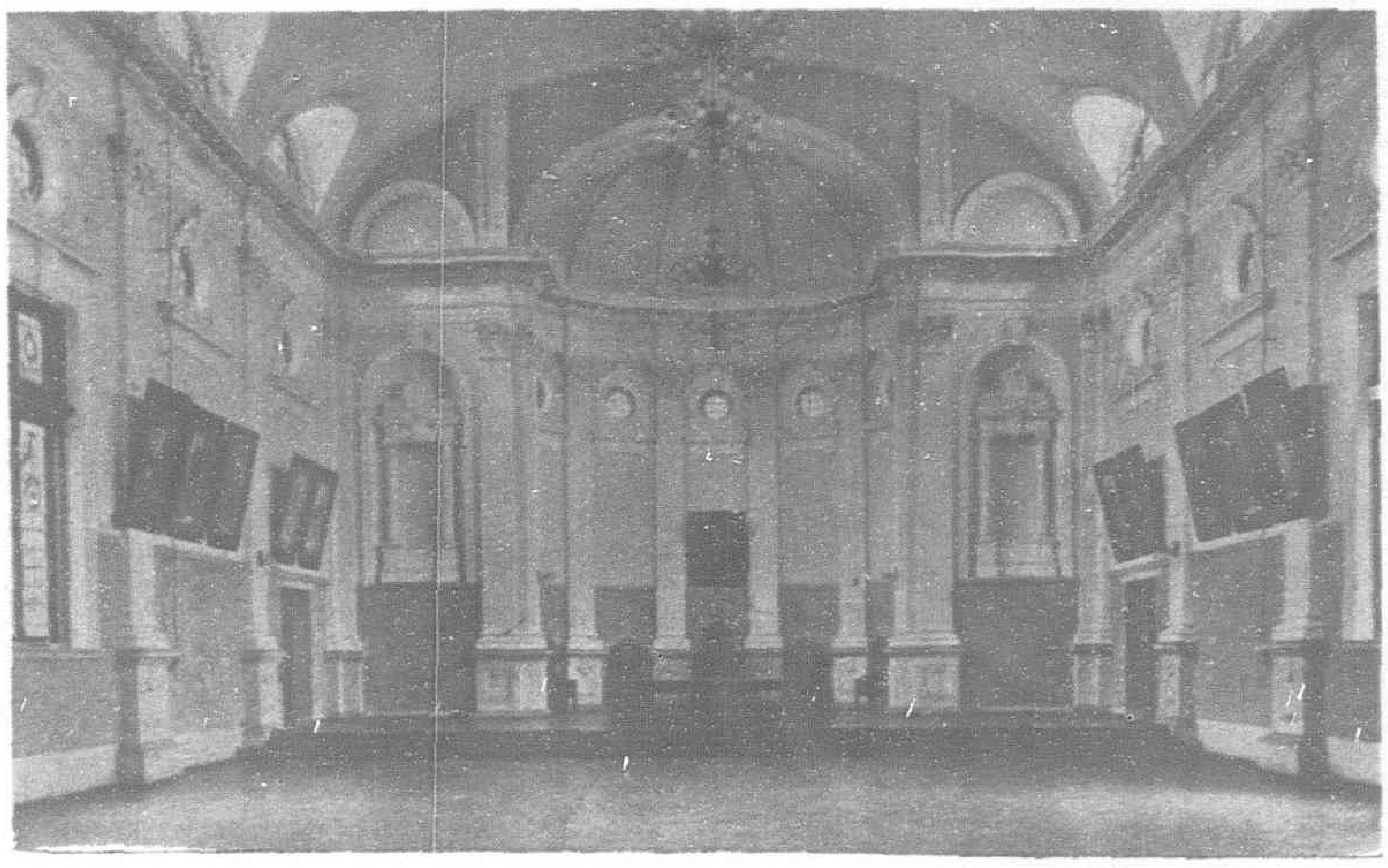
Main building of the University of Hongkong opened March 15, 1912

The Young Engineer

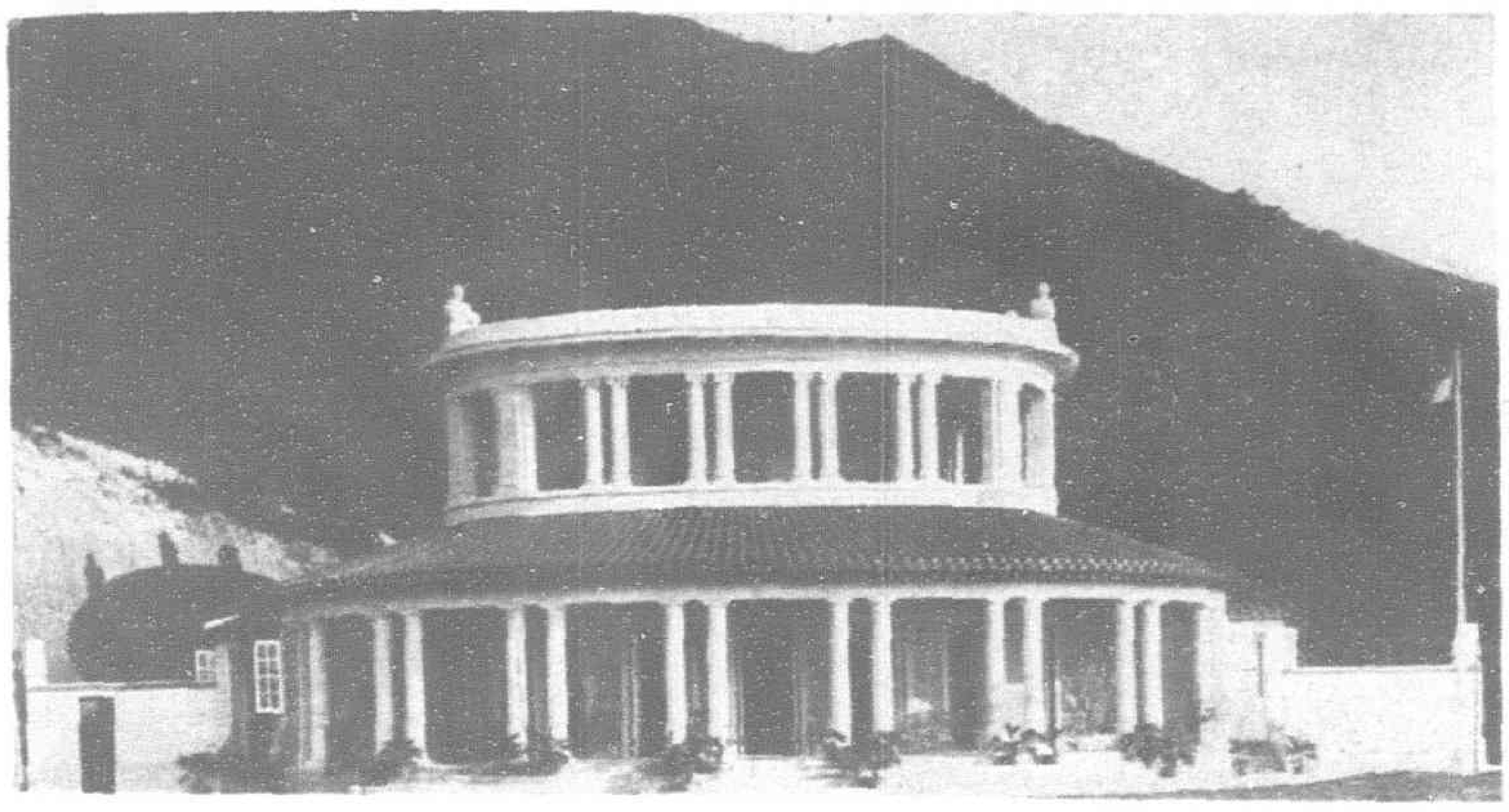
As my life has been spent in training young engineers, it is perhaps not surprising that applied science seems to me to be about the most important thing for China to-day. Many years ago Buckle wrote "the actions of bad men produce only temporary evil the actions of good men only temporary good; and eventually the good and the evil altogether subside are neutralized by subsequent generations, absorbed by the incessant movement of future ages. But the discoveries of great men never leave us; they are immortal they contain the eternal truths that withstand the shock of empires, outlive the struggles of rival creeds and witness the decay of successive regions." The works and inventions of the engineer have had much greater effect upon the prosperity and the happiness of people than all of the efforts of politicians. China to-day needs many engineers to transform the country.



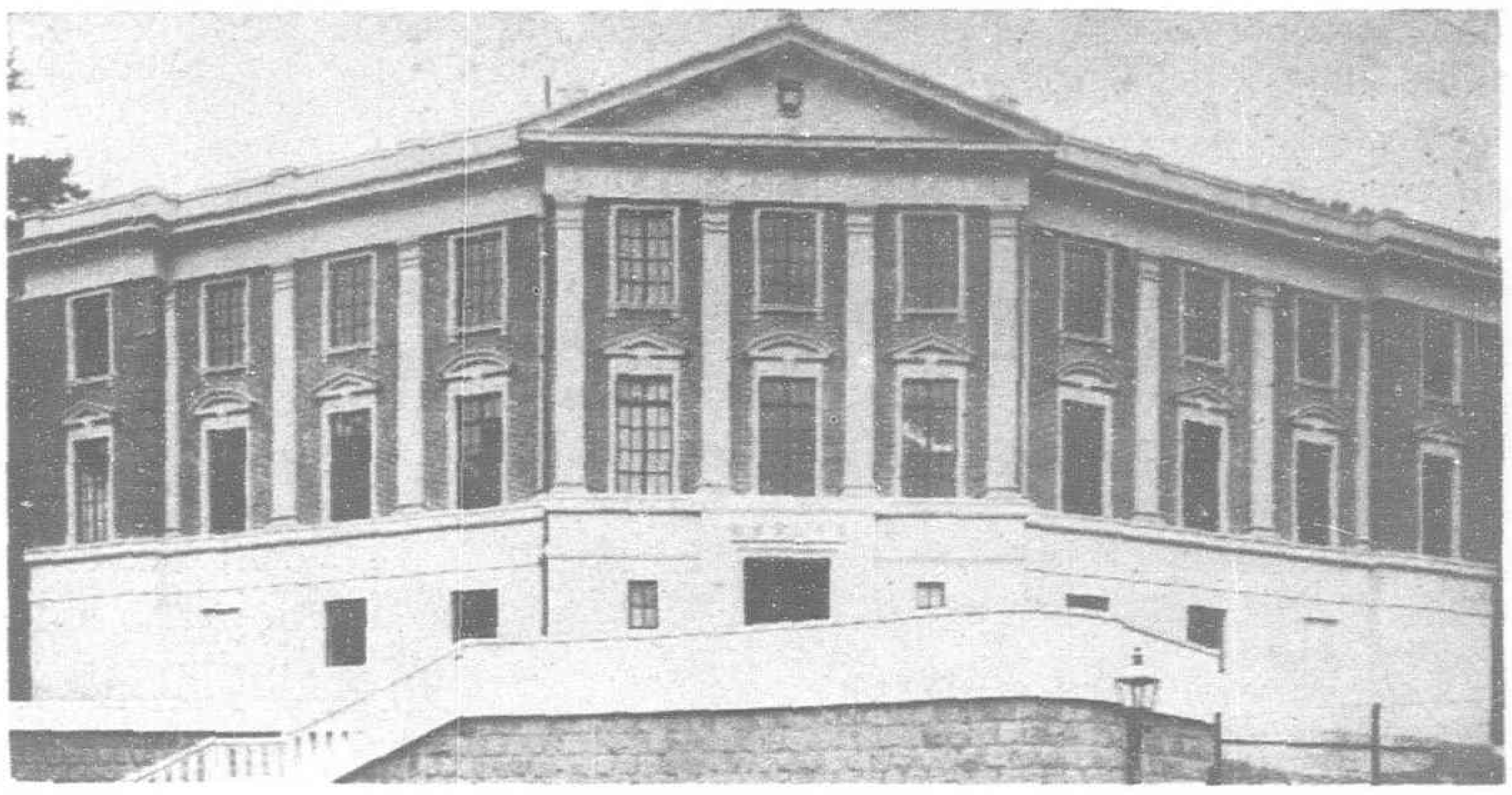
The Ho Tung Engineering Workshop, opened in 1924



The Great Hall at the University of Hongkong



The Sports Pavilion



The Chinese Library

There is the American definition that "an engineer is the man who can do for one dollar what any fool can do for two." There is the rather more stately definition of the functions of the engineer in the notable words of the Royal Charter granted to the Institution of Civil Engineers in Great Britain. This Charter was granted more than a century ago by King George—in 1828. The objects of the engineer are there stated as follows—they are to "Adapt, Convert and Apply the Great Sources of Power in Nature to the Use and Convenience of Man." It was in these remarkable terms that those civil engineers of more than a century ago issued their prospectus.

More Power Needed

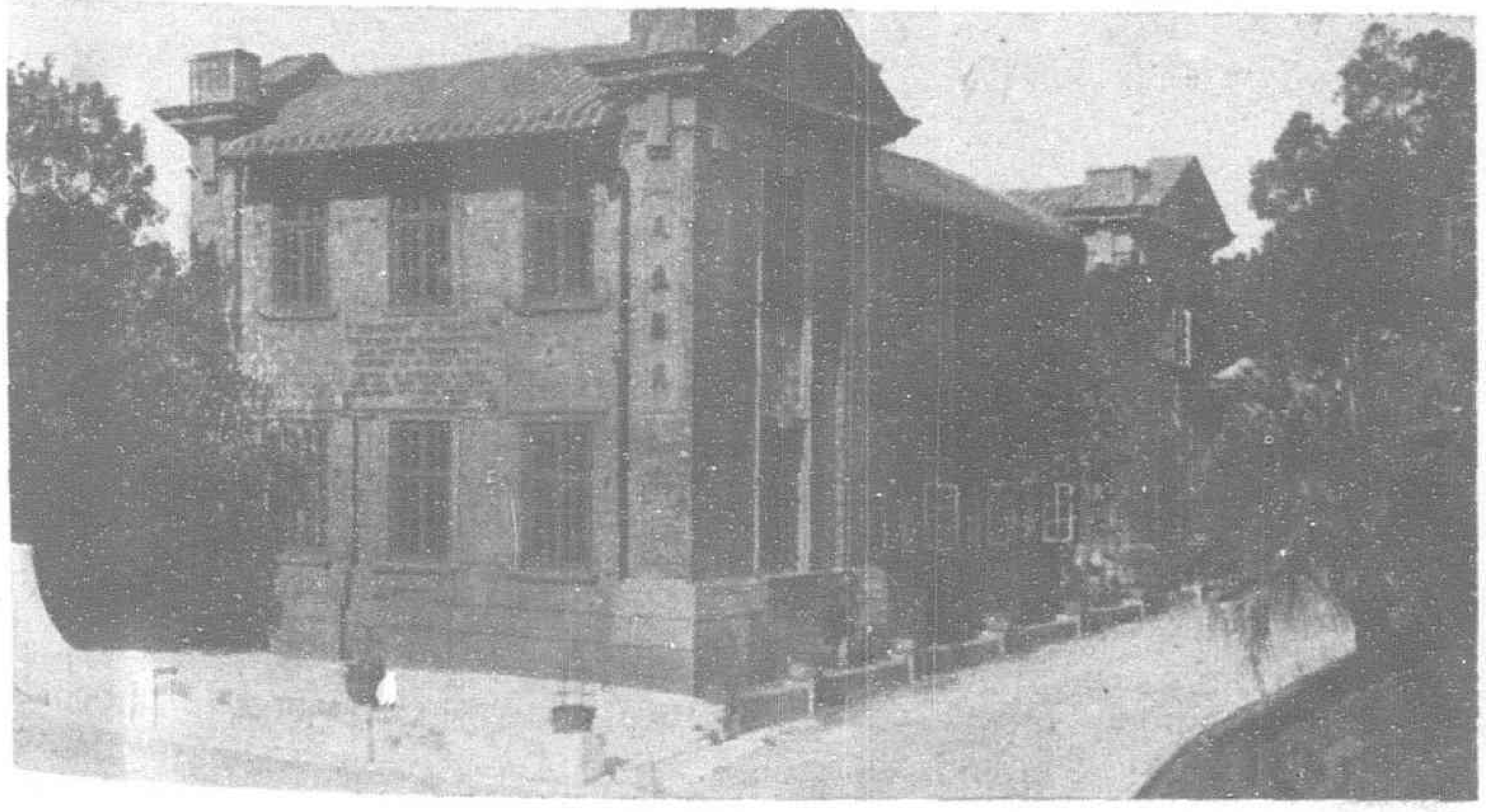
So long as industry is dependent only on the slow drudgery of human labor it can only drag painfully along. What is needed to create a higher scale of living is *more power for the work of the world.*

If you have *power* at your command you can accomplish a great deal. Now the engineer does not pretend to *create* power. He knows that there is abundant stores of energy laid up by Nature in coal, oil, rushing waters and even in the winds and tides. Taking these gifts of Nature, he wants to use them for the benefit of man, converting them by such mechanical (or electrical) machines and instruments he may be able to devise or employ.

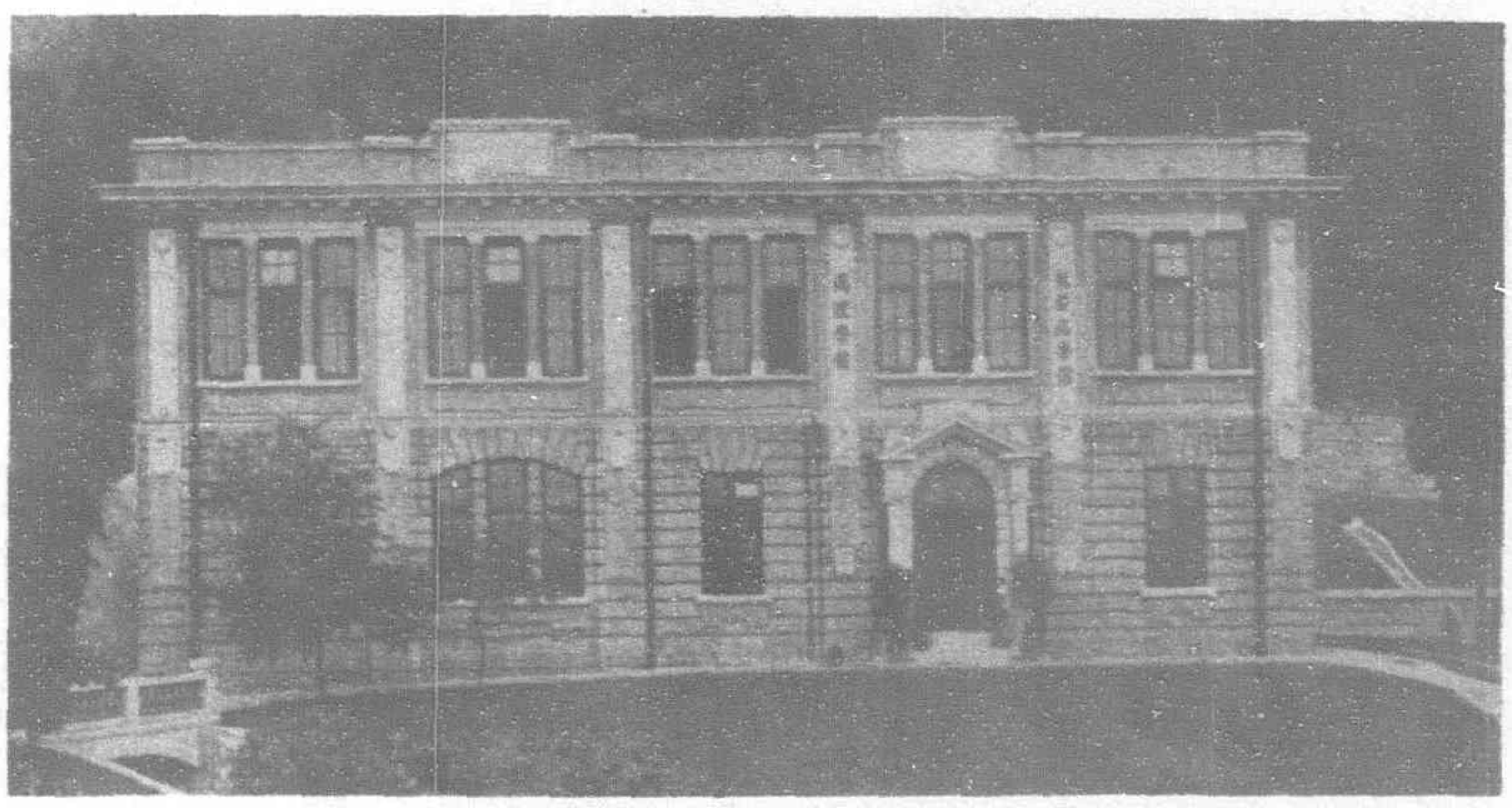
Those ambitious engineers, who secured their Royal Charter in 1828, stated in that document that the sources of power are to be directed "as the means of production and the traffic in states, both for external and internal trade." But they could do nothing alone. They had to persuade either the Government of their country or some combination of private individuals to furnish the financial means for the execution of the works.

A Great Transformation

That problem exists in China to-day. Nobody doubts the tremendous advantages to everyone—Chinese and Europeans alike—of the development of China's resources by means of applied science. Nobody doubts that, given a fair guarantee of law and order and a reasonable taxation, almost any one of the thousands of suggested schemes of engineering development in China would pay. And indeed, in spite of all of the many disadvantages of the present chaos, confusion and unjust taxation in China, there are already any number of engineering schemes in the country that have paid.



School of Biology

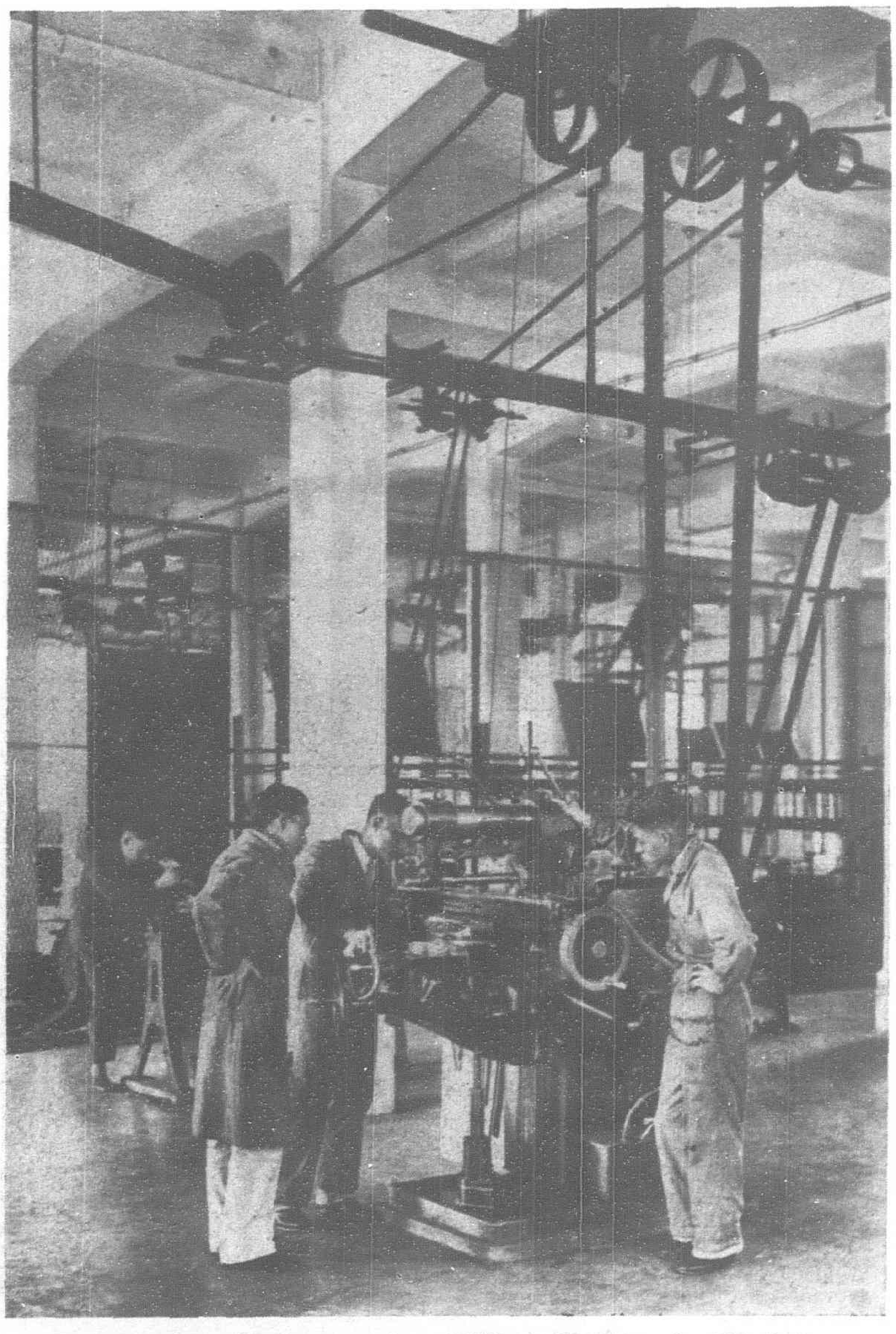


School of Tropical Medicine

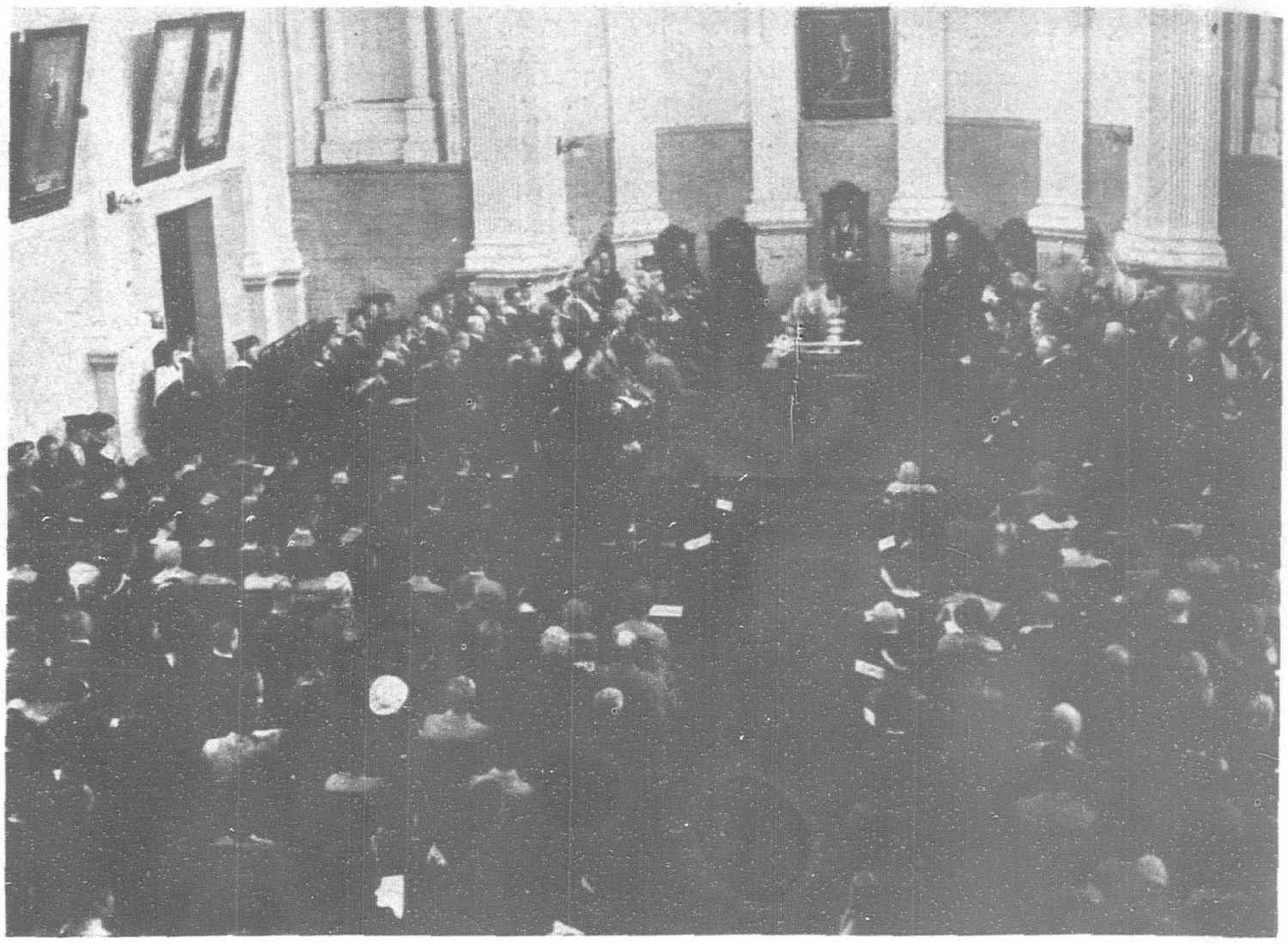
Although foreign advice is valuable, and imported machinery essential, to engineering developments in China, a most important factor in situation is the availability of competent Chinese engineers. For these are the men who must persuade their own people to encourage and support both financially and politically, engineering schemes in China. There are wonderful possibilities for well trained, healthy and energetic Chinese engineers—possibilities unique in the world to-day. They have almost untapped stores of Natural Sources of energy at their disposal and a century of accumulated knowledge about similar work.

It should encourage young Chinese to read of the amazing transformation that has come to England as the result of applying power and engineering works to develop the country.

A little more than a hundred years ago when a certain Prince made a journey not far from London in a coach drawn by horses, the state of the roads was so bad that it took him six hours to drive over nine miles. Cars now smoothly glide over that road up to a speed of sixty miles an hour. In those days the cost of road transport by pack-horse was two shillings and sixpence per ton per mile. With improved roads and horse-drawn coaches it fell to 8d. per ton per mile. To-day it is much less. Some words of George Stephenson, should be displayed in every Government office in China. They are "Let the country make the railways and railways will make the country." And now road traction counts.



Engineering Students using Milling Machine in Workshop



A Graduation Ceremony with H. E., The Chancellor in the chair

The Chinese Engineer

The only people who can transform China are the Chinese. Therefore it is essential to have well trained Chinese engineers. If there is one fact established beyond cavil about Chinese students, it is, this. They should not go abroad until they have reached natural development and possess a good knowledge of the language and social customs of the country in which they propose to live. In other words they should reach a University degree standard in the Far East before they go to Europe or America.

In Hongkong we have now had twenty-one years of experience in this matter of technical training of young Chinese. We have had students from all of the eighteen provinces of China and from overseas—Malaya, Java, Siam, Indo-China, etc. We have evolved a system of theoretical and practical training which, we believe, suits the unusual conditions that obtain in China.

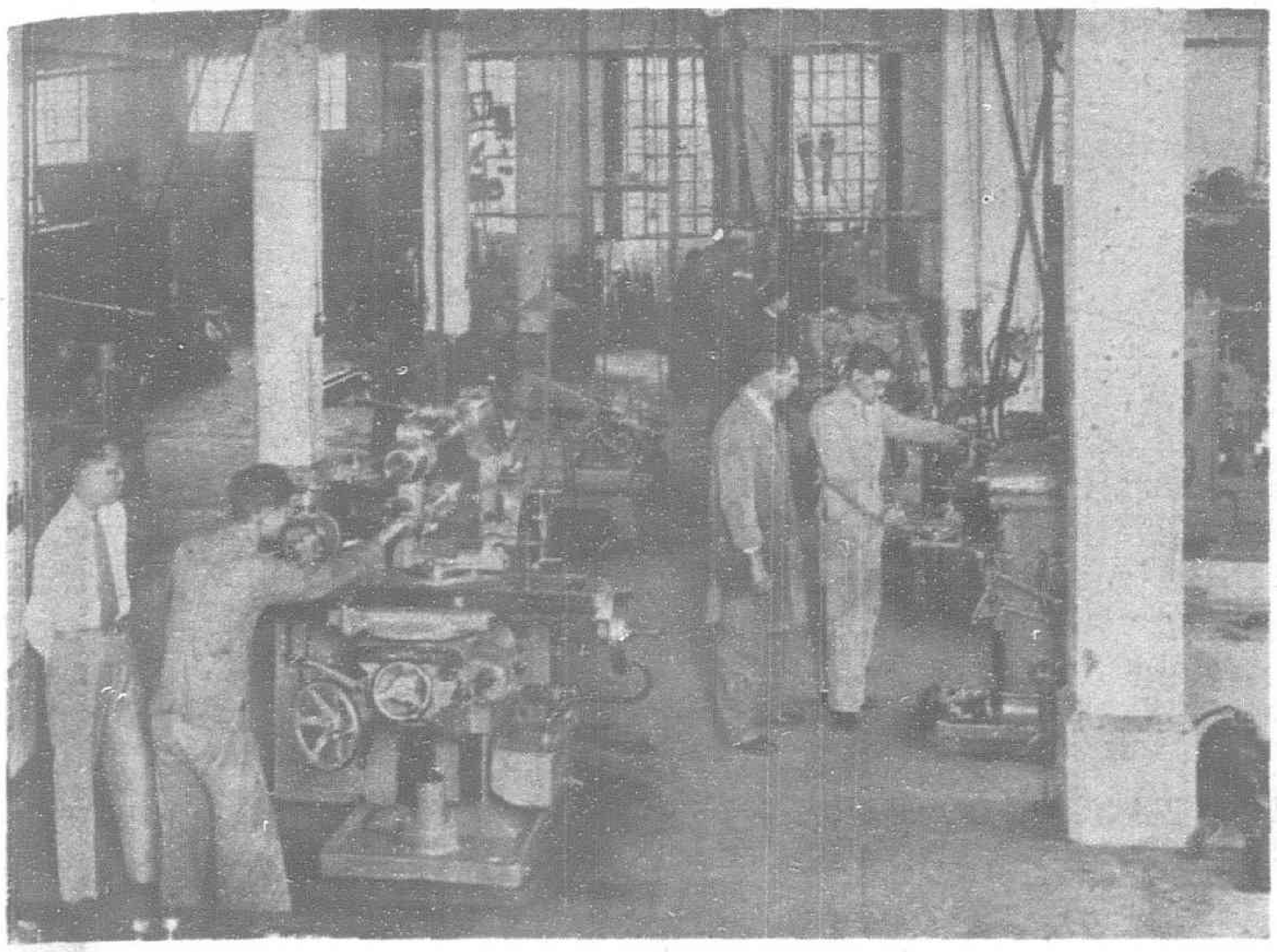
The courses of lectures, experimental work and practical instruction in workshops follows almost identically that given to engineering students in the University of London. The adjustments to local conditions are important, but the final result is that the degree awarded (B.Sc., Engineering) is a guarantee that the student has attained the same standard as that demanded by London University. Every year final papers are sent to Assessors in London who are examiners in that University. And every year their report has been sent to Hongkong stating that certain engineering students in Hongkong have reached the high standard of an Honor degree in London.

At the Imperial College of Science and Technology in London there are post-graduate courses. Candidates for the Diploma, which is granted after a year's study, must possess an engineering degree recognized by the London authorities, Hongkong graduates have been admitted to these post-graduate courses and have won the coveted diploma.

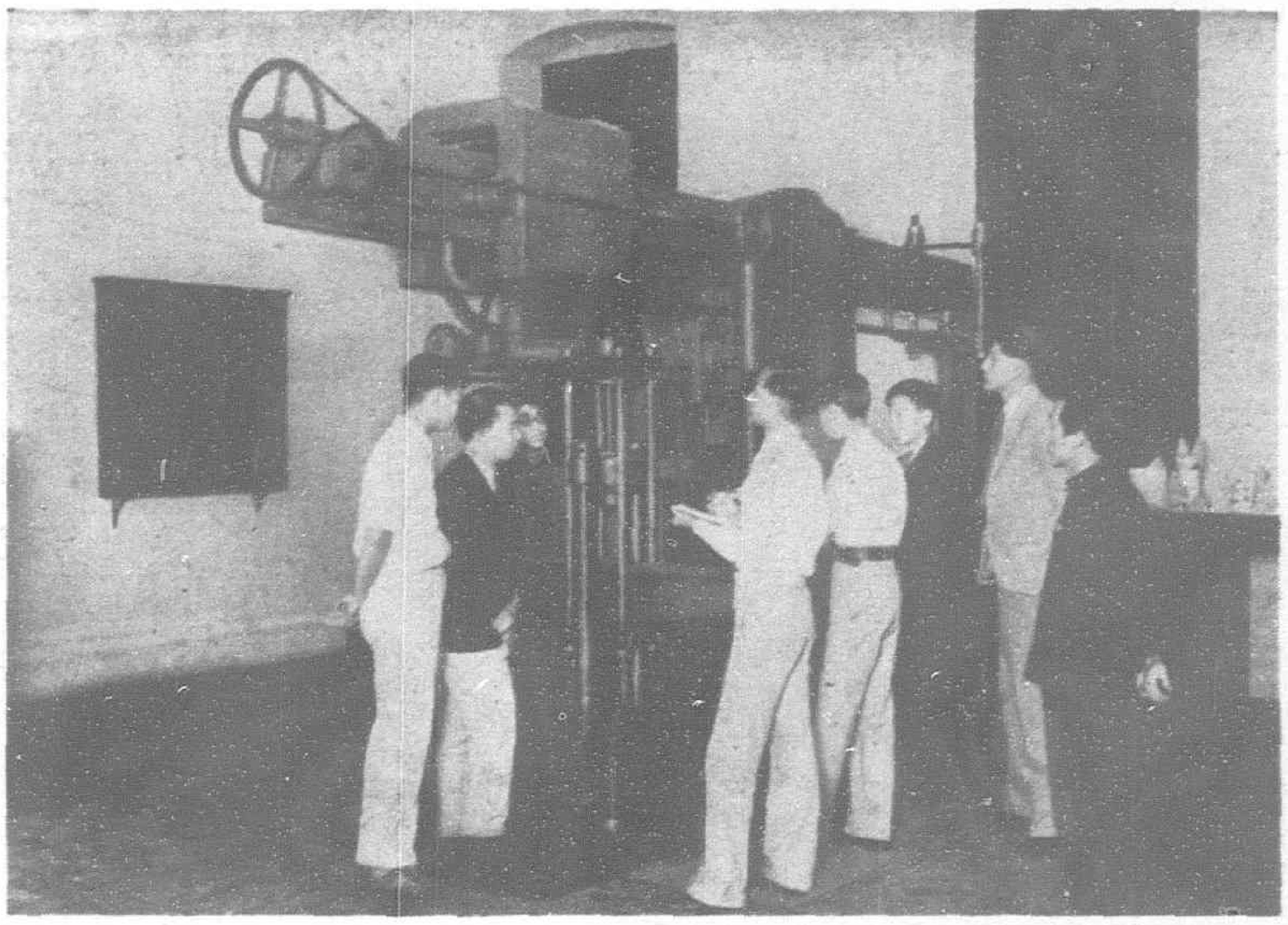
The Eastern Schools

The course of instruction for the London engineering degree takes three years. In Hongkong the course is designed to cover four years. The reasons for the extra year are as follows.

First of all the standard required for matriculation (the admission qualification) in Hongkong is not so high in London. In general, Chinese candidates are not so well qualified in the English language. Therefore special classes are held in the University for those engineering students whose knowledge of English is considered good enough for admission to lectures but not good enough to write a good technical report. Actually only about 20 per cent of the engineering students are required take these special classes in English. But this arrangement is of great value to the engineering



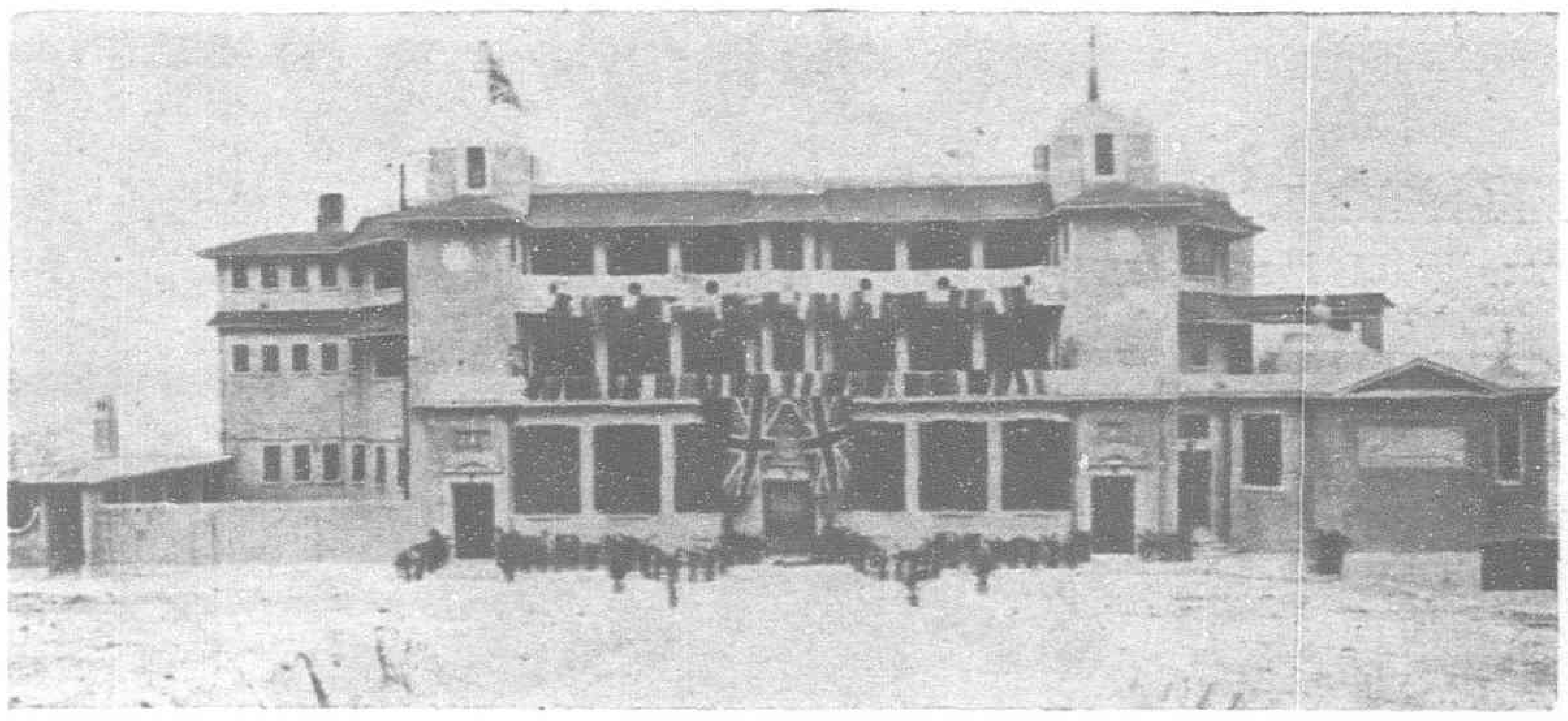
Engineering Students in the Ho Tung Workshop



Testing Steel in the Materials Laboratory

student from the interior of China whose ability to write English is up to standard but who needs practice in conversation.

Many candidates for admission to the University have little, or no knowledge of Physics and Chemistry—fundamental subjects for engineers. And so the courses in these subjects in Hongkong University are spread over a longer time than in London.



Ricci Hall, a Hostel

Great emphasis is given to practical instruction in Hongkong. When the student from the interior arrives here he has little knowledge of machinery or technical terms. Unlike the schoolboy in Britain or North America he has seen nothing, or but little, of industrial life, modern methods of transport, etc. Terms, such as "lever" and "magneto" and "carbureter," and "efficiency" which are now commonplace in the vocabulary even of an English girl as young as twelve years, are new to the Chinese undergraduate. And so we have devised a special system of instruction so that new students shall know what such words mean. They make elementary experiments with pulleys, levers, cranes and on friction, etc., so that they can acquire a working knowledge of technical words.

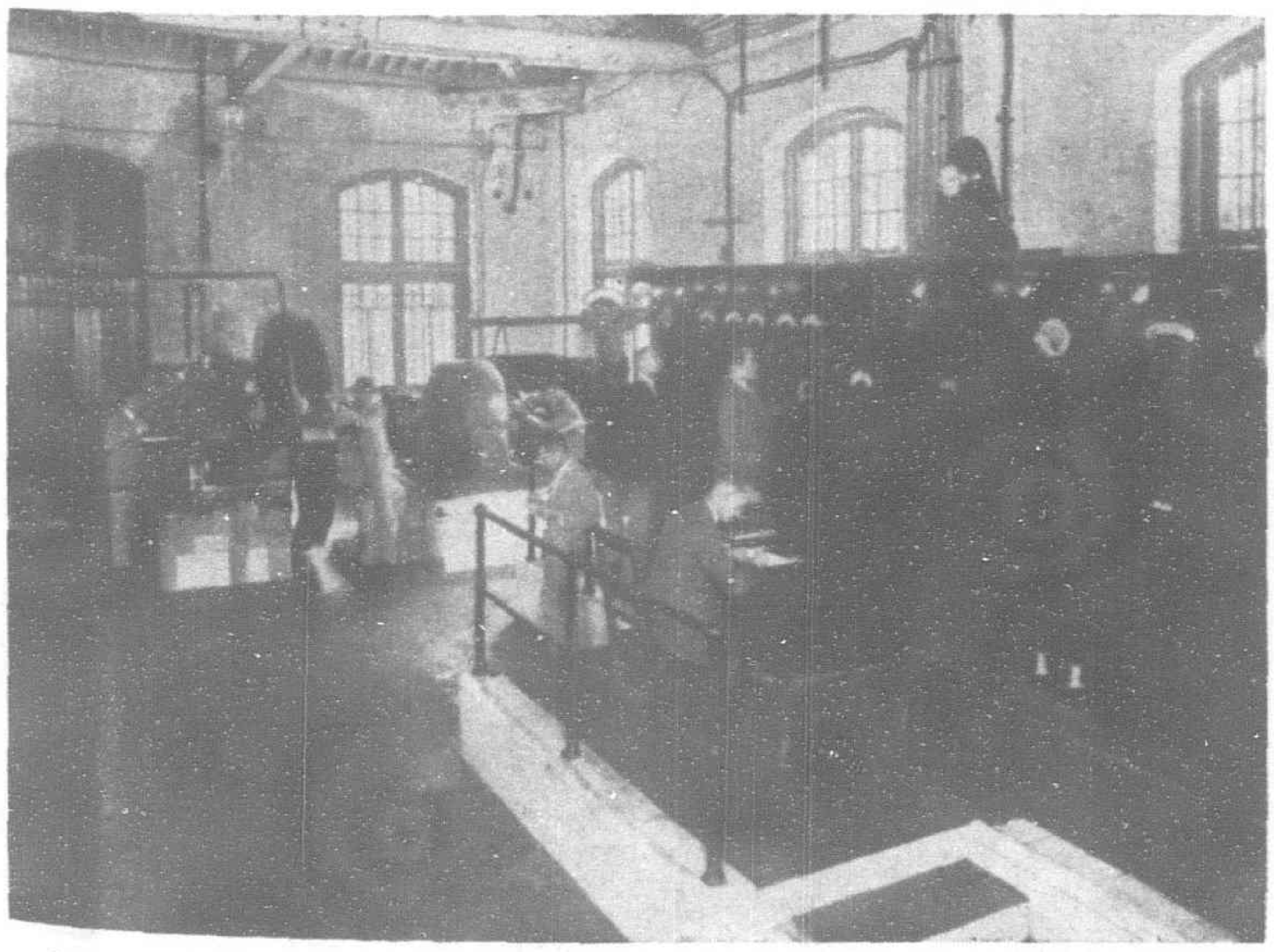
Again, experience has taught us that, the new environment of a semi-European style life in the residential halls of the University, on the recreation grounds, and in the social life of Hongkong, is so strange to students from the interior that it takes them a few months to adjust themselves to the new conditions.

On the other hand they are still in contact with China and there is not that shock which is caused by an abrupt change from Asia to Europe or America such as happens when the young Chinese goes abroad direct from school.

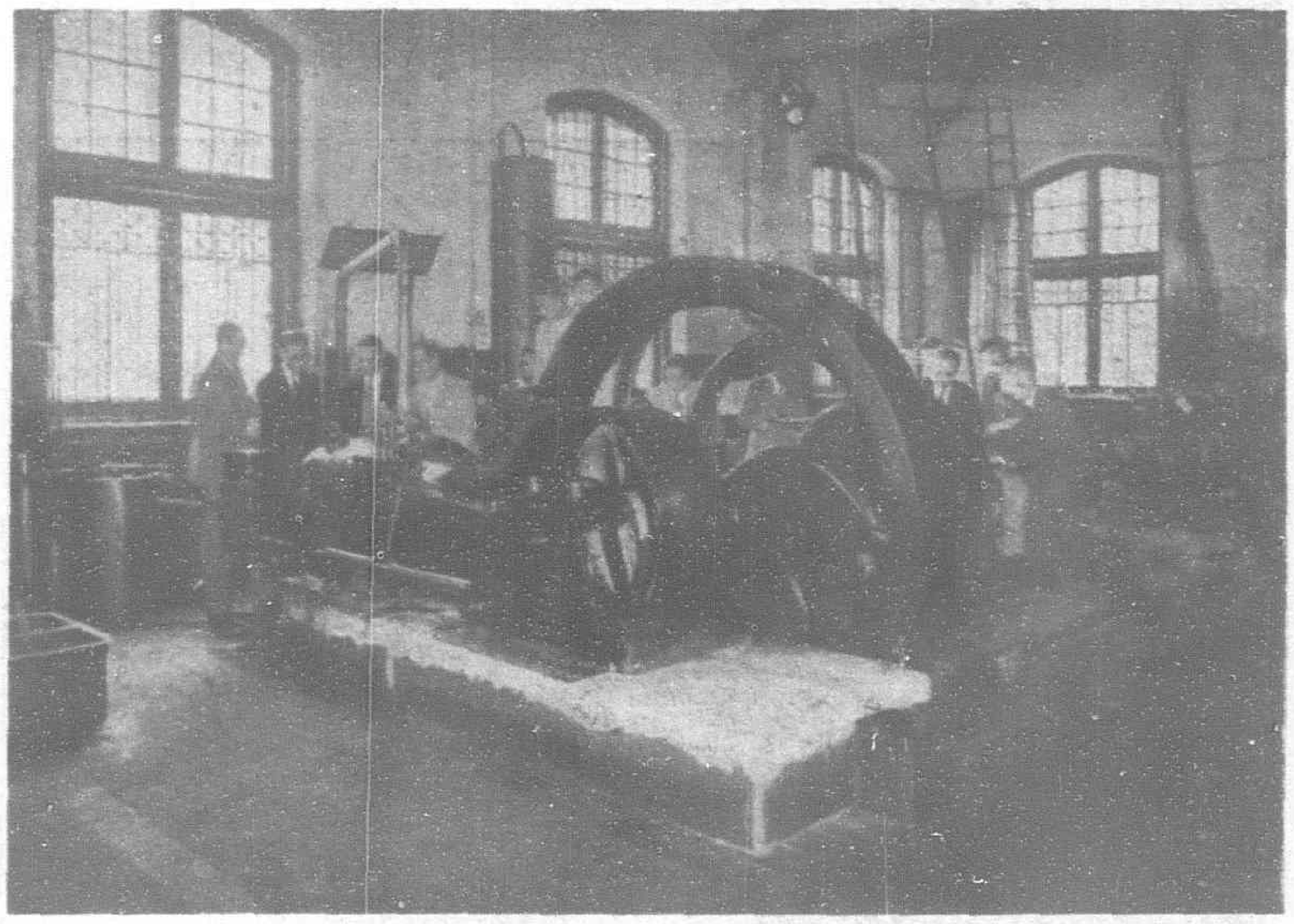
The machines in the University workshops are strange to new students so that it takes them longer than Europeans to handle them. For that reason, and many others, the writer urges the undergraduate to put in a few preliminary months, or even a whole year, in the University, before commencing the first year course in engineering. If he elects to do this he can attend workshops during that time and so ease the burden in later years. He will certainly gain much benefit by so doing, for he will have more time for studying and that should enable him to secure an honor degree.

The Graduates

One of our difficulties is to keep in touch with graduates. We have, however, obtained, from time to time, information about their work which is encouraging. We are convinced that many of them have done splendid pioneer work in China.



The Electrical Power Station at the University of Hongkong



Engineering Students in the University Power Station

The majority of the engineering graduates in the past elected to specialize, in the final year, in civil engineering. Many of them have obtained work in Government offices. Practically all of the roads in Kwangtung and Kwangsi, we have been informed, have been built by Hongkong graduates. Some of the schemes for reconstruction work in Canton were planned by these men. Some have specialized in reinforced concrete construction and have done useful work in erecting new buildings.

It is, however, with the development of mechanical and electrical engineering in China that the biggest changes will take place. This is no attempt to deprecate the work of the civil engineer, for China needs better communications, good water supply, etc. But to increase the wealth of the country the natural sources of power must be utilized.

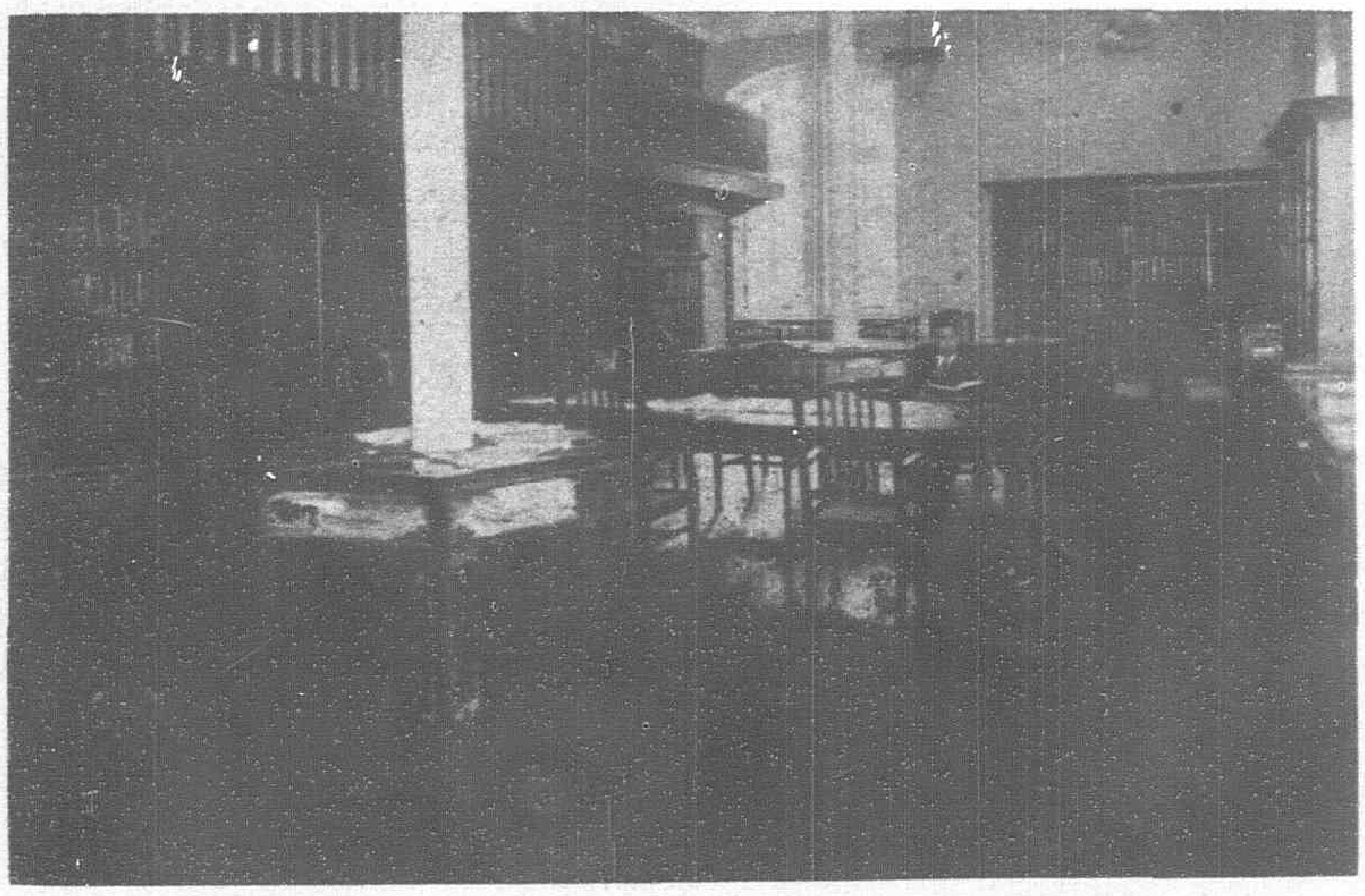
The professional Chinese engineer is fortunate in the qualities of the Chinese workman. The following words were written by one who had long experience with Chinese artisans and coolies. His verdict, concerning their value as workers was as follows :—

> " The Chinese laborer has, with some exceptions, a steadiness, a sobriety, and likewise an intelligence, which not seldom renders him invaluable. He is thrifty and economical; yet when he receives good wages he is a liberal spender for what he wants, which makes him an excellent customer. A market among the Chinese, once gained, is said to be one of the most regular, and most susceptible of expansion, of any in the world."

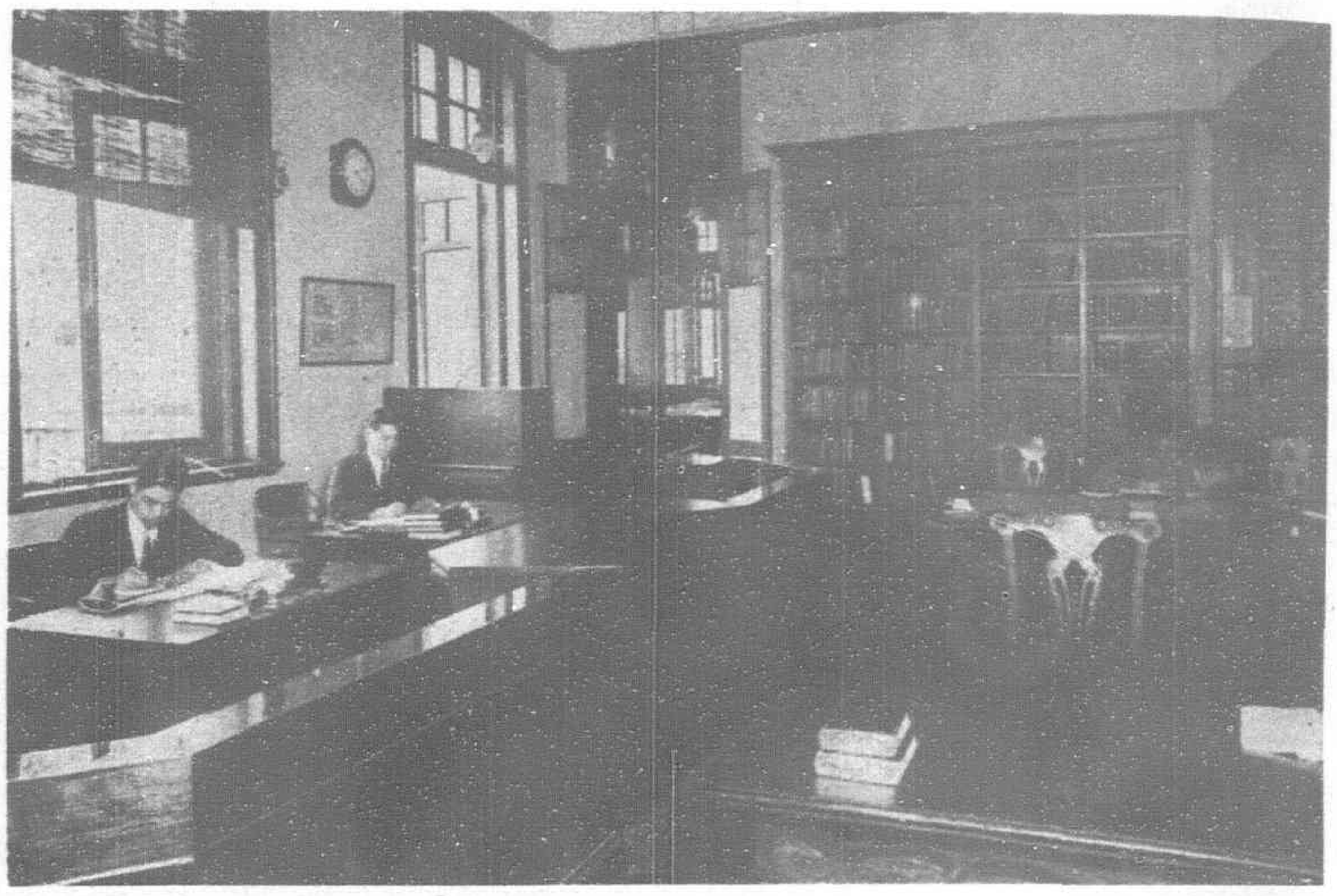
After twenty-one years in close association with Chinese mechanics and laborers the writer heartily endorses that verdict.

On the other hand no power plant can be run efficiently unless the designer and engineer in charge is a man with a good theoretical, as well as practical knowledge, of the work.

The following facts about the duties of one of the Hongkong graduates is of interest.

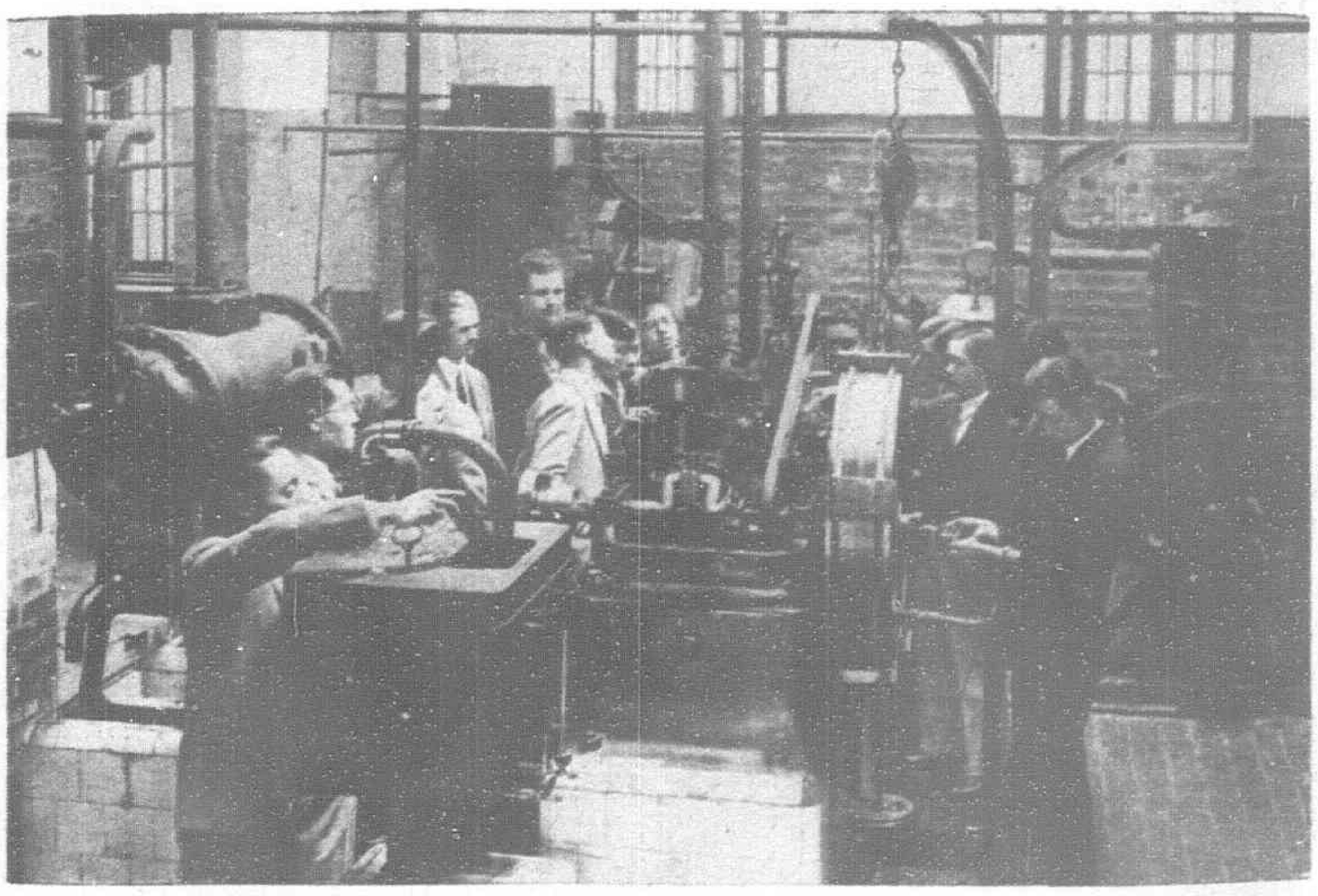


East Library at the University of Hongkong



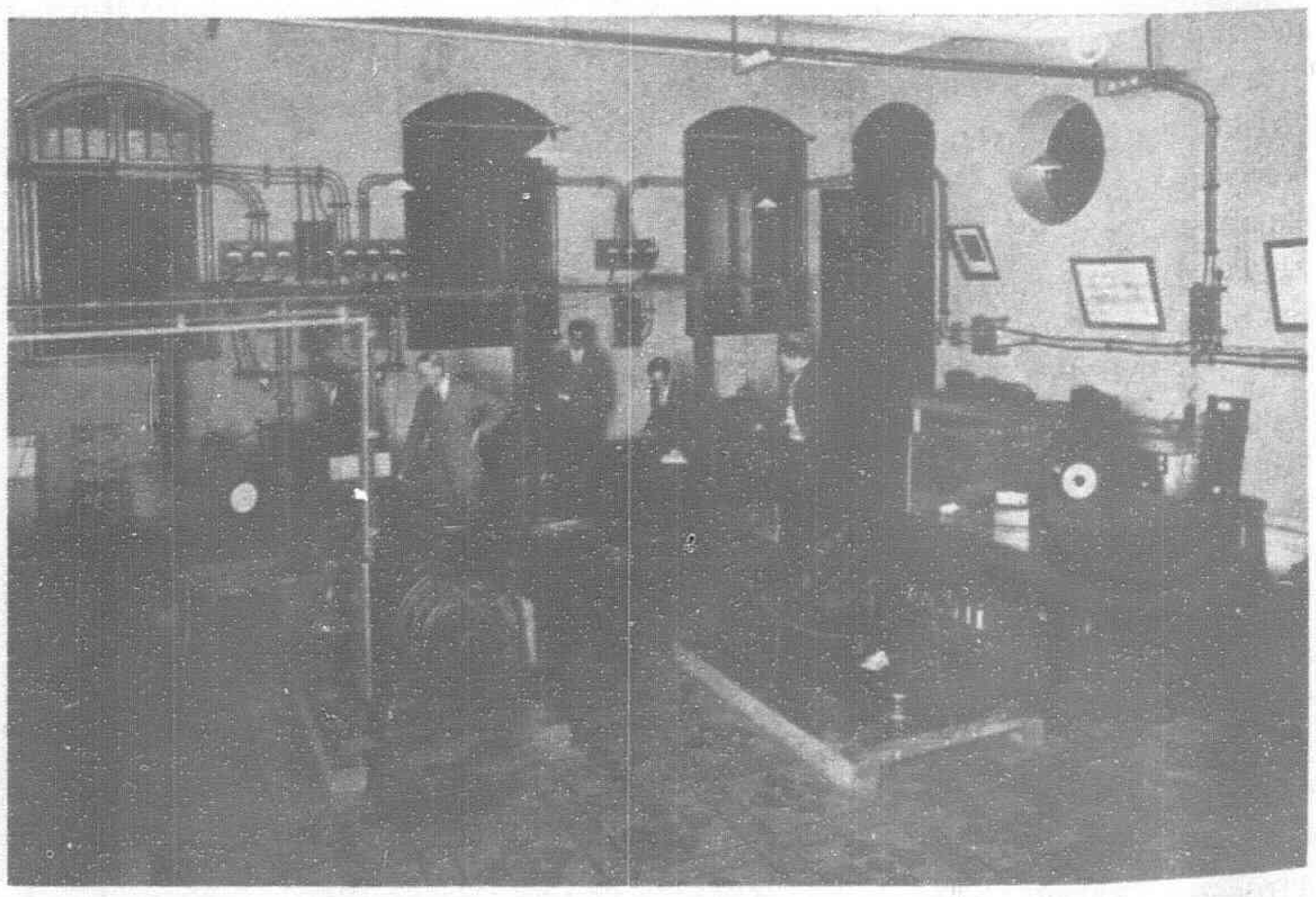
The West Library

Physics Library



The Steam Laboratory

The Chemistry Laboratory



The Electrical Machinery Laboratory

A certain young Chinese engineer completed his University course in 1916. He did some useful civil engineering work in Canton but during the political troubles in Canton in 1925—he was not active in politics—he found his work rendered almost valueless and in the chaos and confusion narrowly escaped with his life. Subsequently he obtained a post as engineer in a power plant in North China. To-day he is engineer-in-charge of one of the most up-to-date installations in the Far East. He has increased the overall efficiency of the plant from 15 per cent to 21 per cent. He now obtains a killowatt-hour for a coal consumption of 1.4 lbs. the calorific value of the coal being 10,600 B.Th.U's. per lb.

The plant suffered badly in the political troubles of recent years, but the young Chinese engineer set to work and had it in order again after some months. Over 80,000 electrical units are generated each day, with a consumption of (about) 50 tons of coal at a total cost of Taels (Shanghai currency) of 0.012 per unit, including interest and depreciation of stand-by plant.

High Pressures

The introduction of high pressure and temperature steam generators and turbo-alternators, and the economical results obtained with them opened up a new chapter in the history of Chinese industries. For other Chinese mills copied the good example set by this graduate from Hongkong. A well-known firm of boiler makers —Messrs. Babcock and Wilcox Ltd.—now realize that 400 lbs pressure per square inch and 400° centigrade temperature is not at all dangerous practice in China.

This is merely an example of what can be accomplished by a well-trained Chinese engineer. In practice the graduate from Hongkong has had much more workshop and power production instruction than had his predecessor of 1916. We have since erected the Ho Tung Workshop, a big building 95-ft. × 95-ft. and equipped with modern machine tools.

The University Authorities have recently decided to spend $100,000 on a new Prime Movers Laboratory, to be situated adjacent to the Ho Tung Workshop, the building to be of the same dimensions. In that power station will be installed various types of gas, heavy oil, and petrol engines ; also steam engines, turbines, air compressors, refrigerating plant, etc. All engineering students will have practical experience with this modern machinery and make commercial tests on the various engines, etc. The new building should be available for the students in January, 1934.

There can be no doubt that Chinese bankers, merchants and industrialists do realize the importance of developing native industries by means of mechanical and electrical power. And transport is also improving in China. Recently a motor-car agent mentioned a 500 mile journey by car from Kongmoon, not far from Hongkong. He said that when a couple of bridges are completed he will be able to motor from Kongmoon to Saigon, in Indo-China.

Many of these new roads in Kwangtung and Kwangsi provinces have been built by Hongkong Engineering graduates. It is only by men with good professional qualifications that such work can be accomplished.

There is a grave danger that the standard of engineering instruction in China will be less than that usual in Europe or America. Every effort should be made to maintain a high standard.

It is of interest to note that, after twenty-one years, the number of students taking engineering subjects in the Hongkong University is 110, the highest on record. The cost in Hongkong is less than studying abroad and the advantage of keeping in contact with China during the undergraduate stage is obvious. But after graduation it is advisable to have about two years abroad so as to see examples of modern industry and to obtain practical experience.

Japanese Electro-Chemical Industry

In November of last year a meeting of leading electro-chemists was held in Tokyo to talk over the founding of a new organization for electro-chemistry in Japan. This organization, according to the *Journal of the Society of Chemical Industry, Japan,* will be named "Denki-Kwagaku Kyokwai (The Electro-chemical Association)" and will embrace not only persons engaged in research but also those engaged in industrial circles. The need of an electro-chemical society has long been felt among electro-chemists, and until now there has not been a society embracing all the electro-chemists of the country. To-day, almost all the branches of the electro-chemical industry, exist in Japan. The only exception is the manufacture of aluminium, of which convenient raw materials are lacking. The reason that their electro-chemical industries are on such a small scale lies in the geographical situation of Japan, which is entirely isolated, and therefore has not the outlet for these products in the neighboring oriental countries where chemical industries are not yet prosperous enough to demand the primary products of this industry.

Hydrogenation of fatty oils is one of the important industries in Japan, but the consumption of hydrogen in this direction is insignificant as compared to that for ammonia synthesis, and moreover not a small part of the former is supplied by the hydrogen from electrolysis of brine. The production of nitrogen in 1931 was 245,000 tons, of which 169,000 tons are by synthetic process and other 77,000 tons by calcium cyanamide process. The Japanese nitrogen industry suffered much from dumping from England and Germany a few years ago, and the price then of this commodity fell even below the lowest limit which had been expected. But now, under the favor of the reprohibition of export of gold this industry is making constant developments. The manufacture of calcium carbide is one of the oldest electro-chemical industries in Japan. The production in 1930 was 253,000 tons, 180,000 tons of which were transformed into calcium cyanamide. A part of them is utilized for the manufacture of acetic acid at the Ogaki plant of the Ibigawa Electric Co. and at the Minamata plant of the Japan Nitrogen Co. In the latter one acetic anhydride is manufactured as well, and production of acetate silk is now contemplated. Calcium cyanamide is produced from eleven factories where special furnaces of continuous types are generally adopted for the nitrogenation of calcium carbide.

Japanese electrolytic soda plants have a capacity of 35,000 tons of caustic soda and 30,000 tons of chlorine a year which corresponds to 14,000 kilowatts of electric power. According to the sudden increase of the production of viscose silk in recent years, our demands for caustic soda are also showing a rapid increase. But the problems of the economical disposition of chlorine and the supply of industrial salts of excellent quality make it difficult to meet the whole demands of caustic soda in home by this process alone. For such reasons considerable amounts of caustic soda are manufactured lately by the caustification of soda ash. There are eleven manufacturers of electrolytic soda ; three plants adopt the mercury process but others are based on diaphragom processes of various types. Chlorine which is produced is utilized mainly for the manufacture of bleaching powders, the production of which is about 40,000 tons per year. The production of synthetic hydrochloric acid and liquid chlorines are rapidly increasing. In 1931, 20,000 tons of hydrochloric acid were produced by this method, which corresponds to 60 per cent of the whole production of hydrochloric acid. Utilization of chlorine is seriously considered, for examples, the application of liquid chlorines to the preparation of pulp and sugar are yielding good results in laboratories. Chlorates are made chemically from chlorine in a few works. Bleaching liquor and sodium chlorate or perchlorate are manufactured, but they are not so important as to need special comments here.

In the manufacture of light metals there are four plants for sodium in Japan, namely at Toyama, Higashi-Iwase, Koriyama and Fushiki, and one plant at Kashiwazaki for magnesium, but none for aluminium. Sodium is obtained by the electrolysis of molten caustic soda and about 1,000 tons of its annual production are partly consumed for the manufacture of sodium peroxide and cyanide and other part is appropriated for the dyestuff industry. Magnesium production is only 48 tons a year now, but the capacity will be doubled in the near future. The usual aluminium ore, bauxite, is entirely lacking in Japan and therefore they have been obliged to have no aluminium industry up to now. As many researches done with a view to obtaining aluminium from clay or alunite are yielding sufficiently good results in laboratories, it will not be long before its manufacture is put in practice on an industrial scale.—*Chemical Age.*

Historical Sketch of Government Railway Bridges in Japan Proper

By *W. HARVEY CLARKE, JR.*

TOPOGRAPHICALLY Japan is a long, narrow country abounding in many ranges of precipitous mountains traversing the length and breadth of its four principal islands. Rivers, although numerous, are not classified as large. In consequence of these physical features, long-span bridges are not necessary for Japanese railways. Considering the total length of the railroads in operation at the present time, comparatively few bridges have more than a 100 meter span. At the end of 1930 the total length and number of bridge crossings for government railway lines reached 473,300 meters and 28,938 respectively.

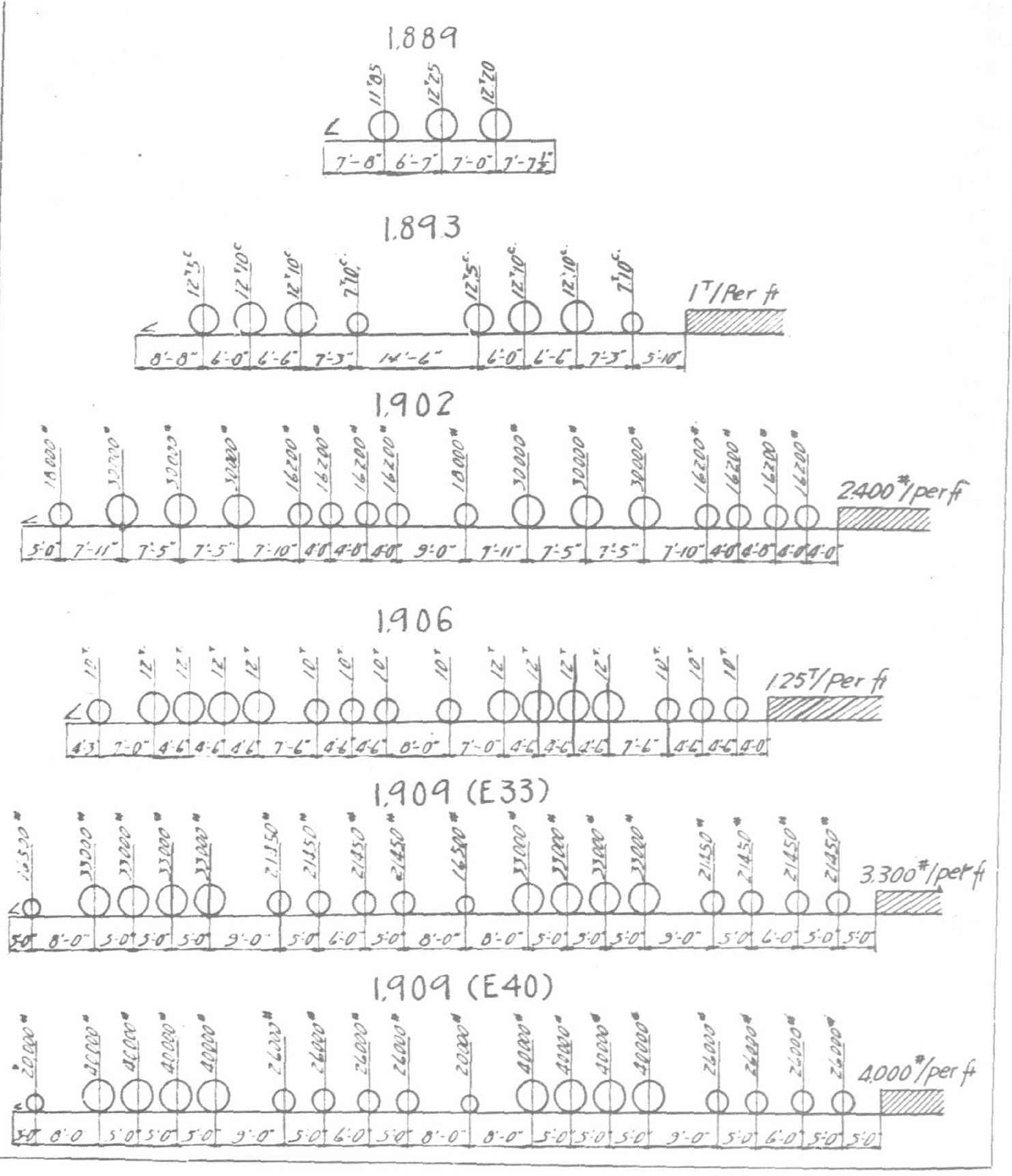
An increase in the live load upon which the designing of bridges has been based is shown in Fig. 1. The E40 type load was used chiefly in and subsequent to 1904.

During the early years of Japanese railway construction, bridges in most part were built according to designs drawn by British engineers, reports Mr. Takesada Kuroda, chief of the improvement department of the Bureau of Maintenance and Improvement of the Japanese Government Railways. Trusses were rivet-connected as indicated in Fig. 2 (*a*) and the designs were usually poor and not economical to follow. About the year 1895, however, the American pin-connection method (Fig. 2 (*b*)) was adopted. Bridges of this type are economical when the span is long and the dead weight relatively heavy.

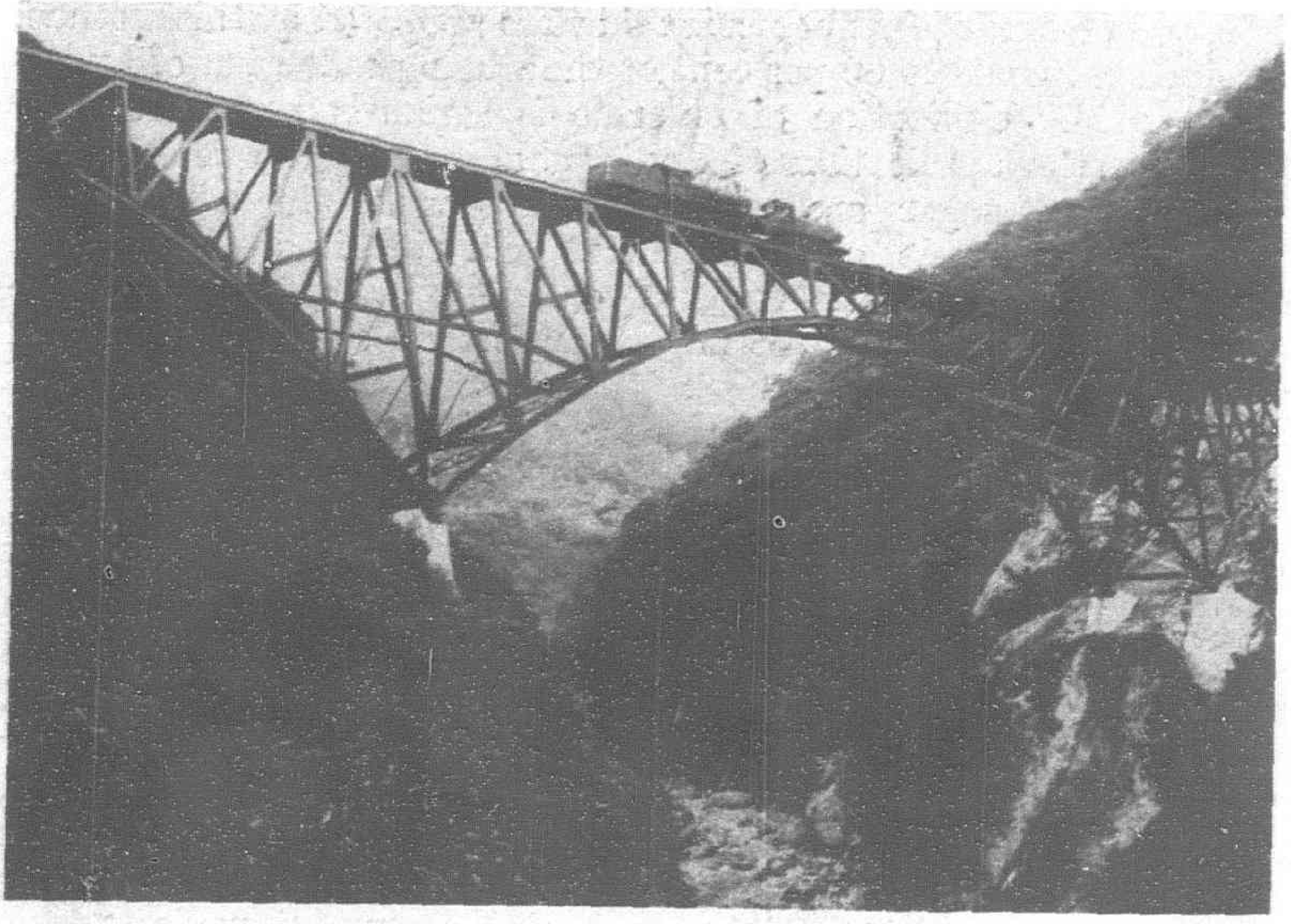
Yet in case of a span less than 100 meters in length, the pins become loosened as a result of continual train passage and irregularities appear in the pins and pin holes. This accelerates considerably the vibration of the bridge. For railway bridges, because their tensile strength and endurance is of paramount importance, it has been conceded generally by bridge experts of many countries that this type of connection does not compare in durability with the rivet-connection.

Fig 1.

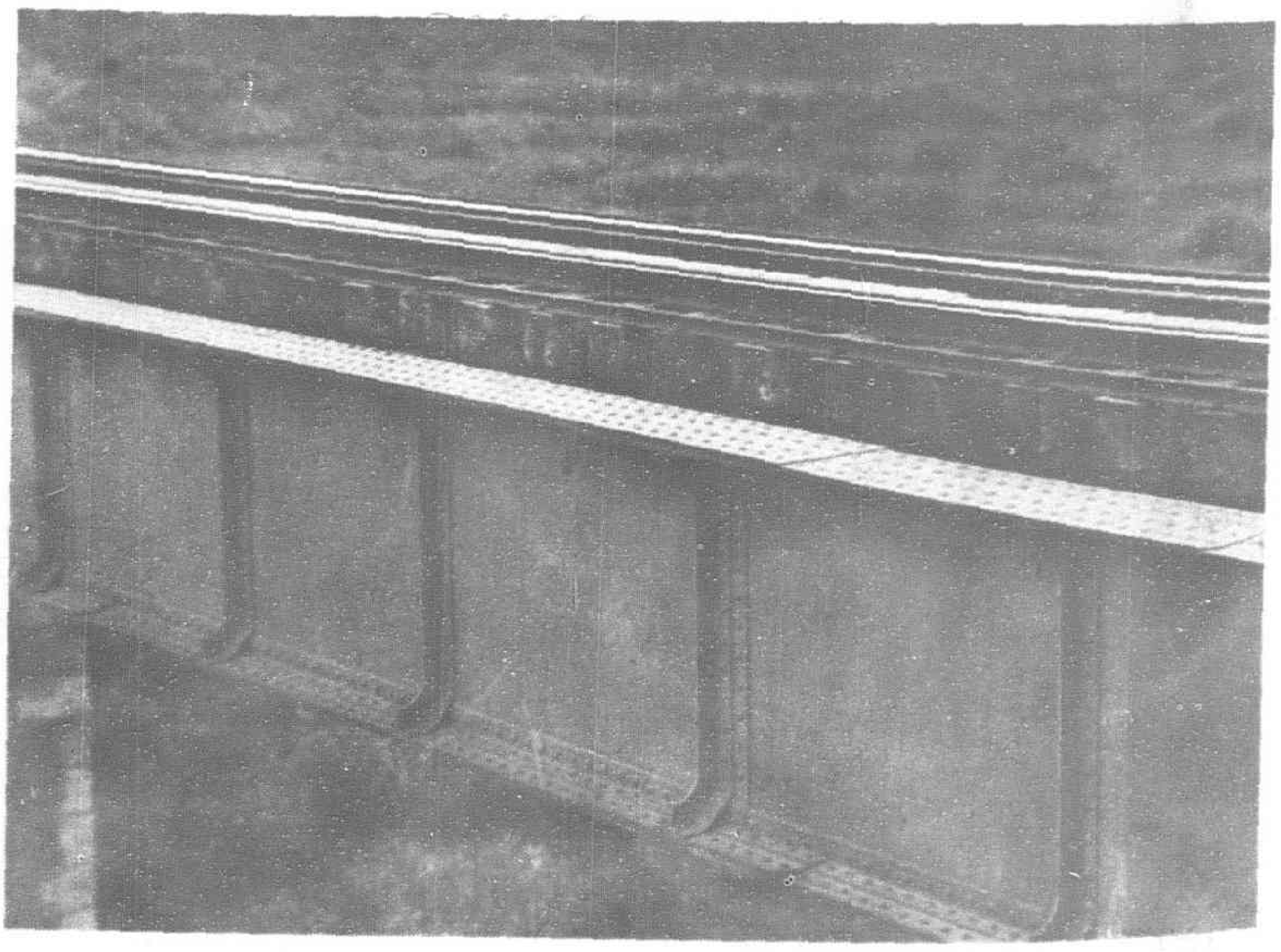
Live load system for Japanese Railway Bridges.



On government railway bridges the pin method of connection for trusses was replaced in 1910, by rivet-connection, as was the practice in other countries. This new kind of connection was known as the Pratt type, which is illustrated by Fig. 2 (*c*).



Illustrating special type bridge, a Balanced Arch Type, 152 meter total span, erected in 1927 near Aso Volcano, Kumamoto Prefecture, by the Cantilever Erection Method in which a Derrick Crane travels over upper chord of Bridge Truss



Showing Double Girders set by attaching beams to both sides of an Old Bridge

But the Pratt type, although practical for pin-connected trusses where eye-bars are used for lower chords and diagonals, becomes virtually useless once the rivet-connection method has been employed. Becoming aware of its disadvantage, later in 1915 the Warren type, indicated in Fig. 2 (*d*), was adopted as superior.

The primary advantages of the Warren type over the Pratt in the rivet-connected truss are, to wit:

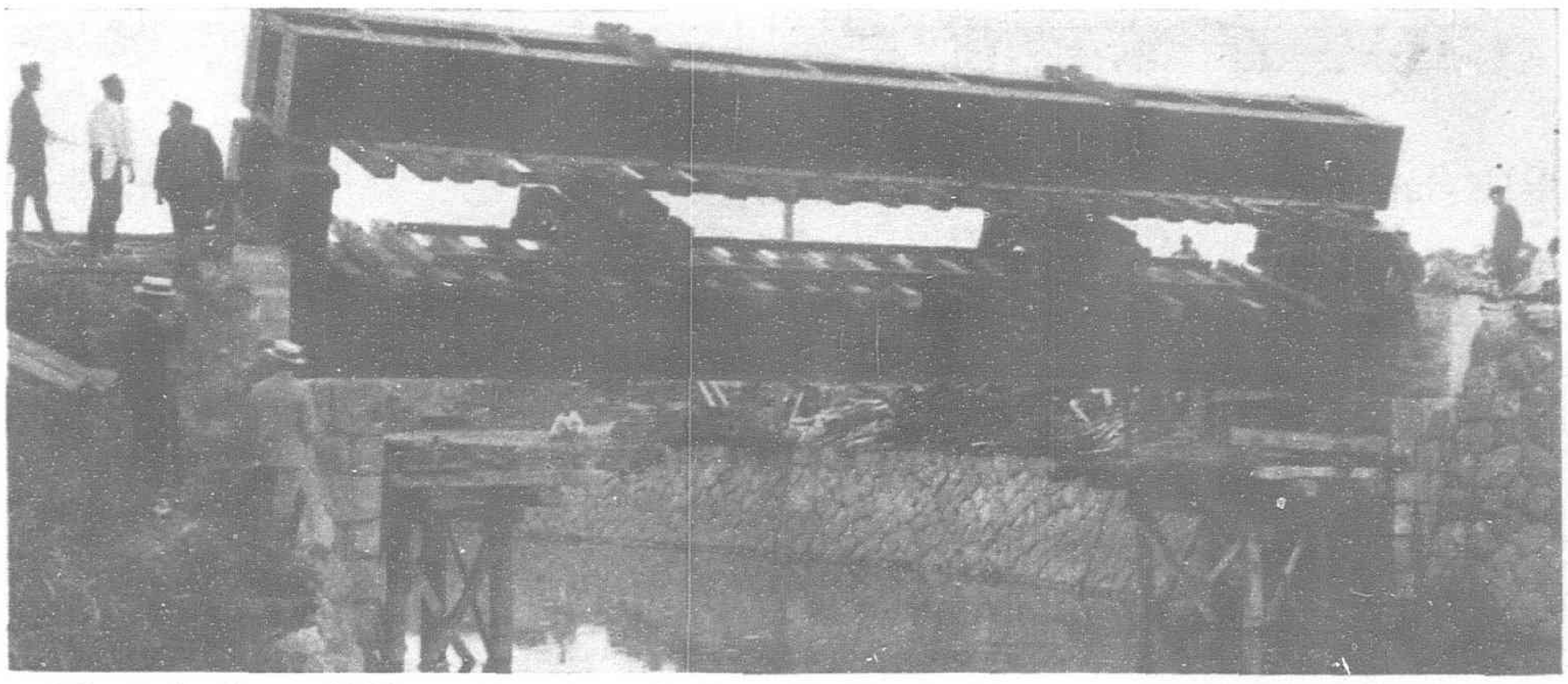
(1) In the Pratt type (*c*) a variety of vertical members is needed, while in the Warren type (*d*) only two kinds of verticals are required,—that is to say, hip-verticals and sub-verticals, which means simplicity in designing as well as in construction.

(2) In the Pratt type (*c*) the stress borne by the chords varies according to the number of panels, while in the Warren type it remains uniform for every two panels lengths. For this reason the number of joints may be decreased to one-half of the number needed in the Pratt type, thereby saving necessary additional material.

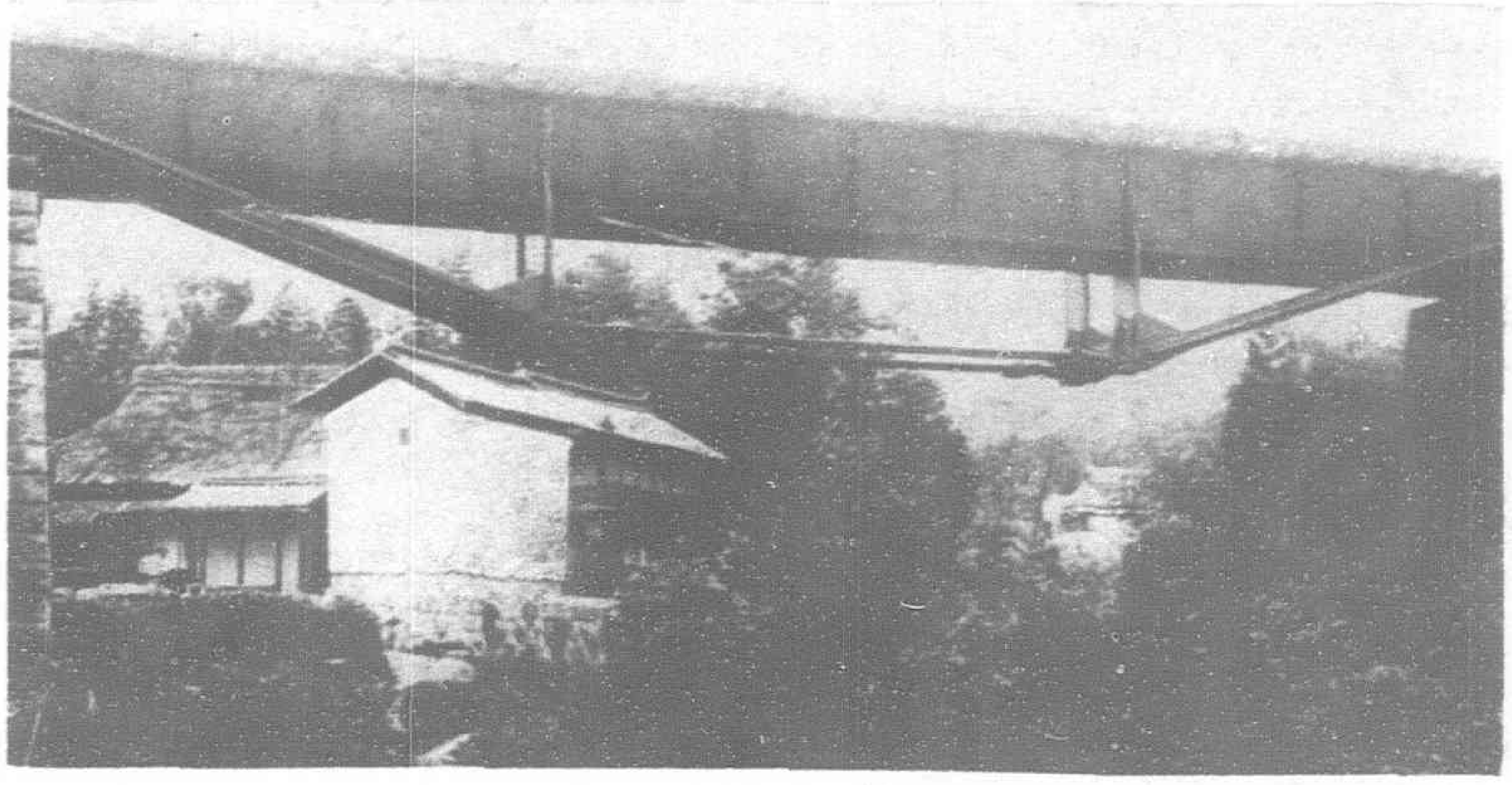
(3) In the Warren type (*d*) the members are, broadly speaking, arranged so that the vertical line passing through the panel point makes a symmetrical axis. This does not hold true for the Pratt type, but it means much less secondary stress which is caused by rigidity at the point of the panel, in the former type.

Ultimately in 1924, type (*d*) gave way to type (*e*), as shown in Fig. 2. These two types are much the same, with the exception

(*Continued on page 335*)

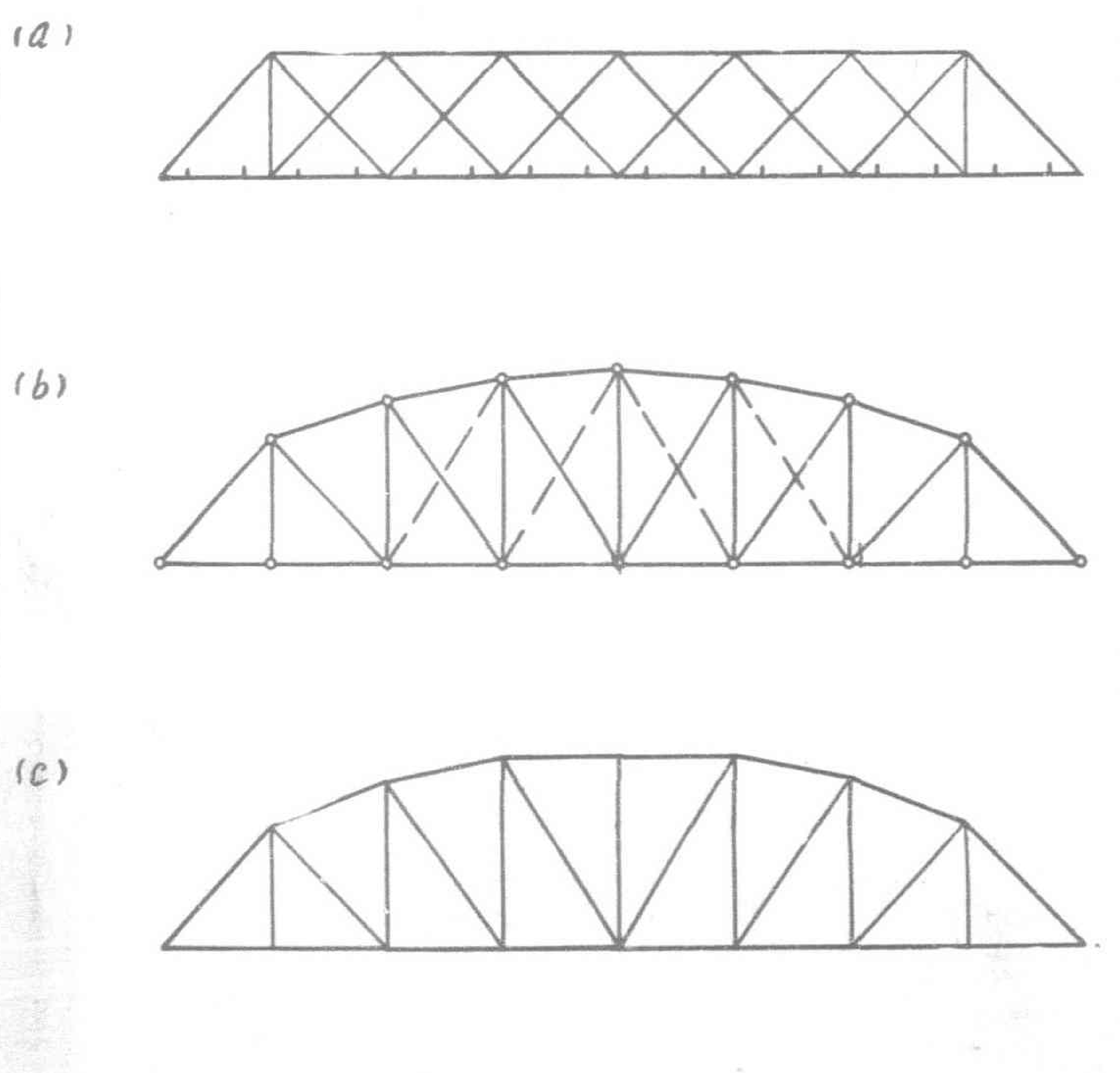


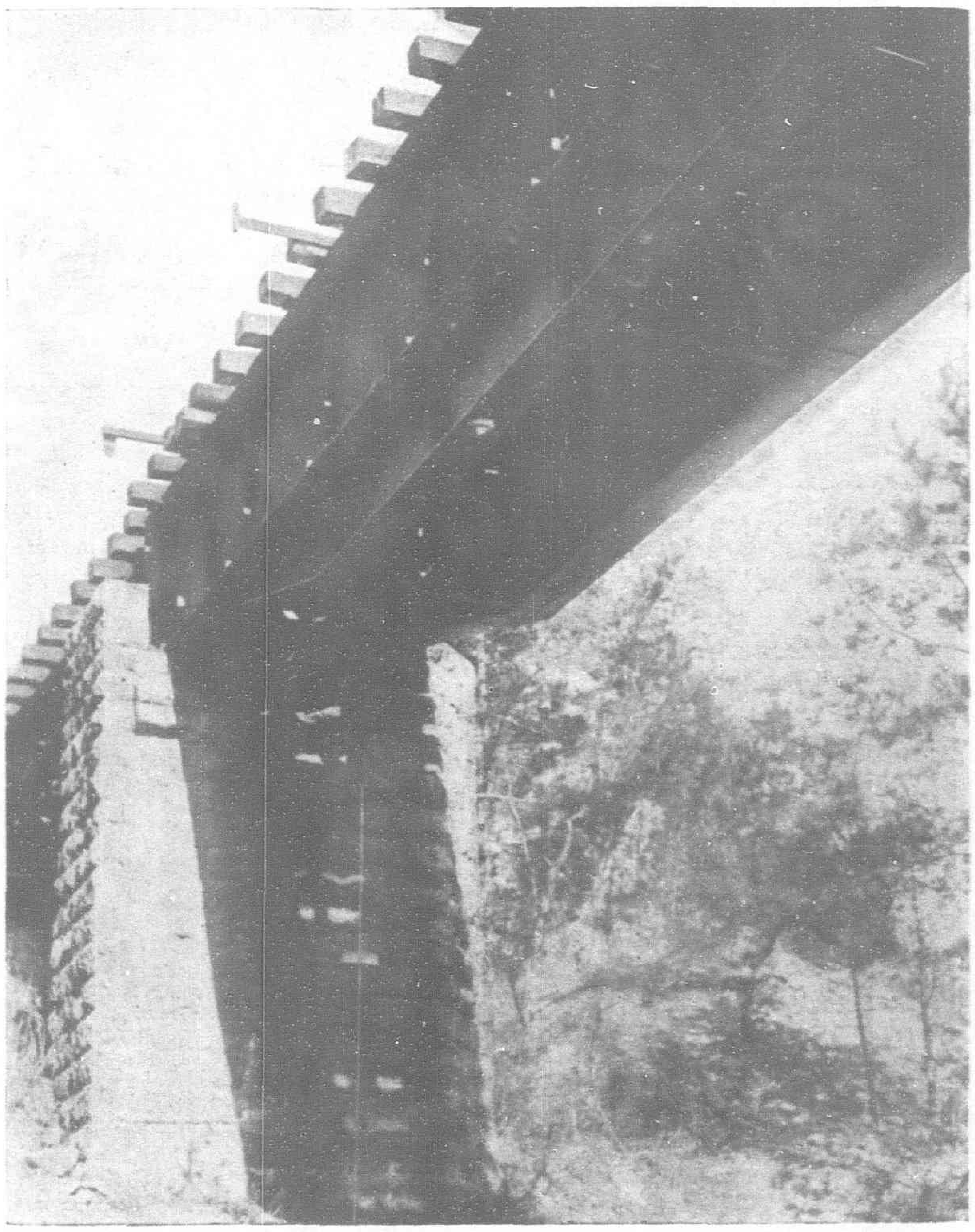
Adopted since 1931, new economical method requiring no Staging with Plate Girders replaced during short intervals of Train Operation



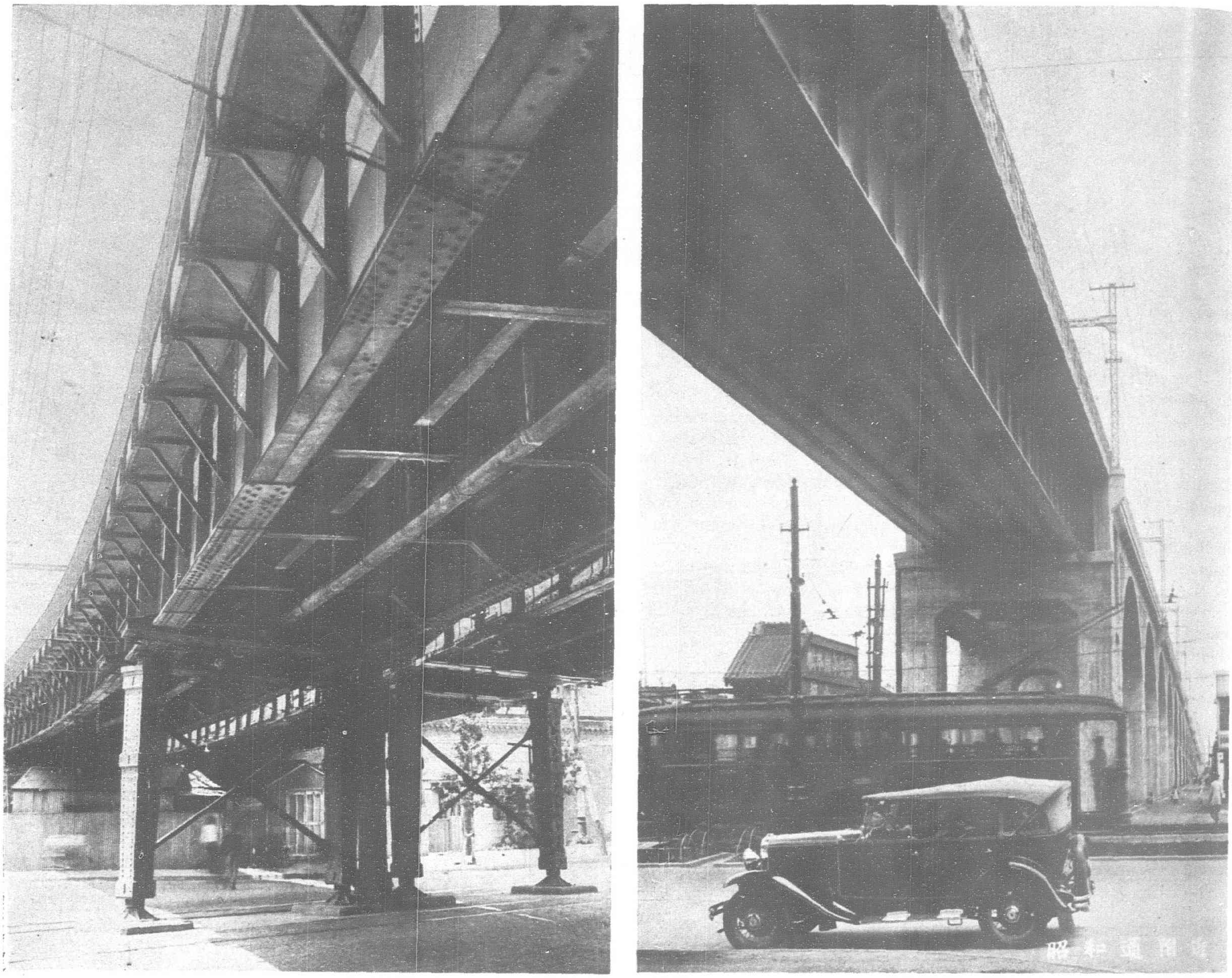
With recent development in Japanese Railway Live Loads, the safety factor of old bridges became insufficient. Therefore Bridges were sometimes replaced with new ones and sometimes reinforced under train service. Illustration shows the Trussed-Beam Reinforcement Method proved to be economical where ample clear-head is provided

Fig 2

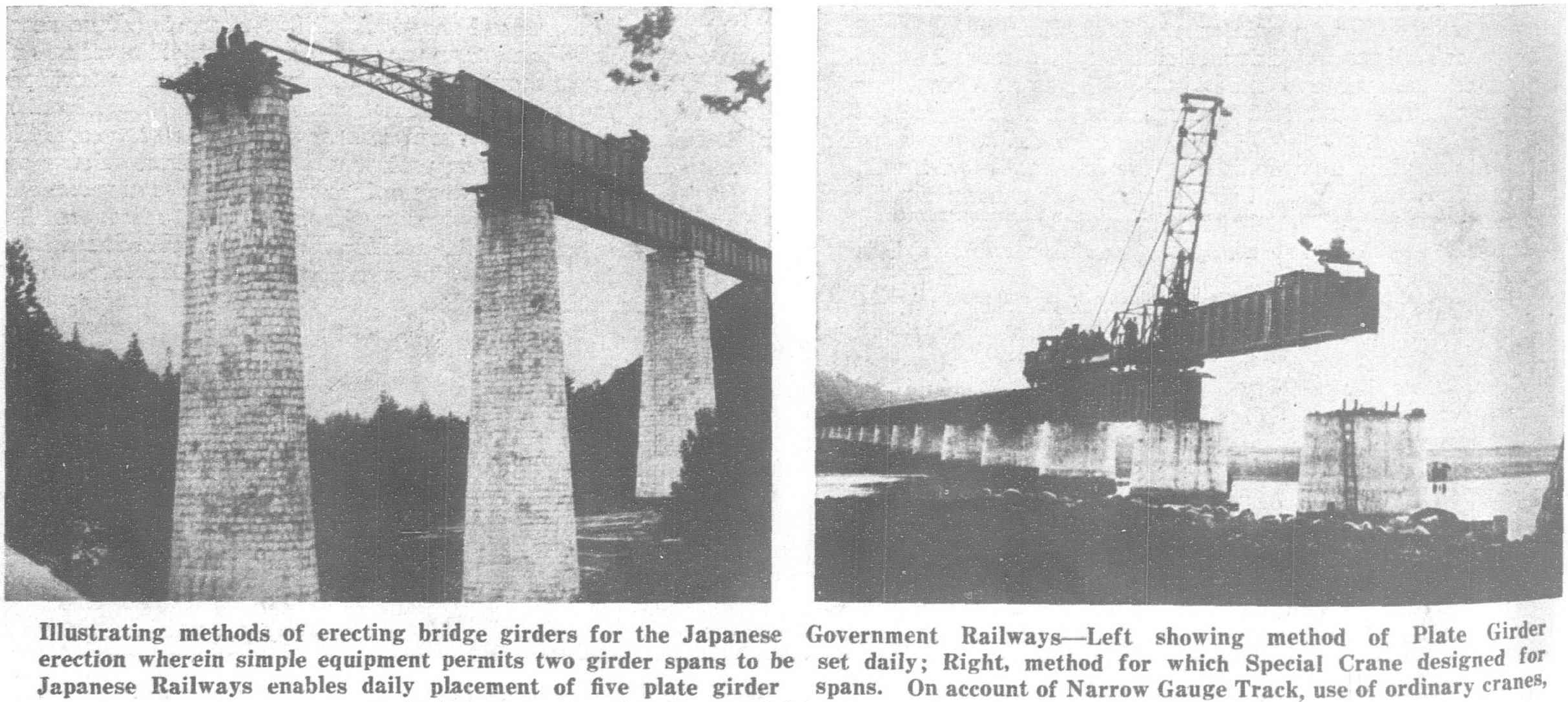




Bridge reinforced by Welding, a method frequently employed for reinforcement since 1932



Other Special Types of Bridges. Left, Curved Bridge having about a 300 meter Radius of Curvature along 60 meter span, erected in 1927 in Front of Manseibashi Electric Elevated Station, Tokyo



Illustrating methods of erecting bridge girders for the Japanese Government Railways—Left showing method of Plate Girder erection wherein simple equipment permits two girder spans to be set daily; Right, method for which Special Crane designed for Japanese Railways enables daily placement of five plate girder spans. On account of Narrow Gauge Track, use of ordinary cranes, as in Europe or America, is attended by danger from low lateral stability

The Nanking-Pukow Train Ferry

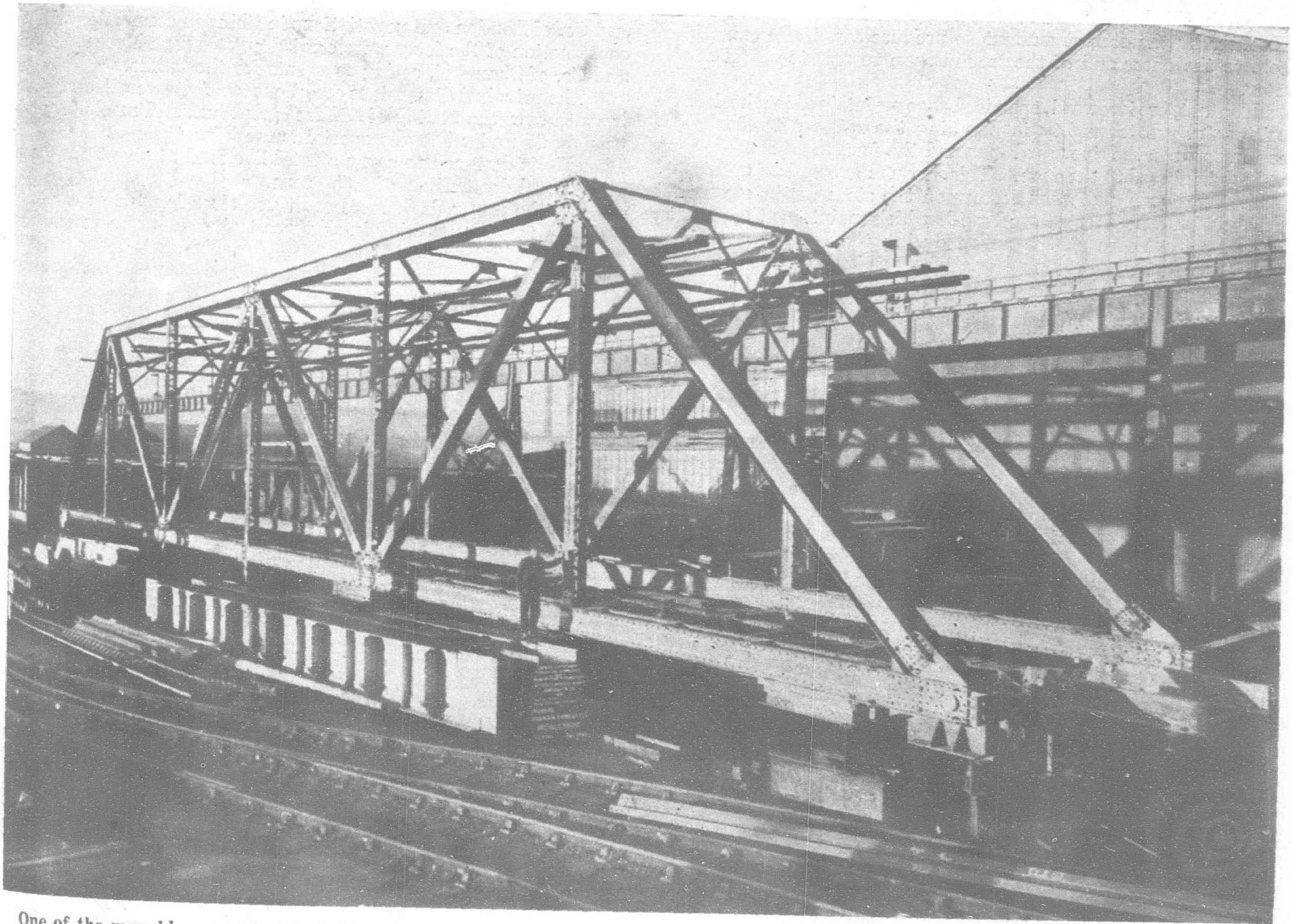
Project to Span the Yangtze River Includes Building of Bridge Approaches to Serve in Conjunction with Specially Constructed Steamer

The project to establish a train ferry service across the Yangtze River connecting Nanking and Pukow and being carried out under contracts made through the London Boxer Funds Purchasing Commission, will be brought into realization in coming months. The train ferry, built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., has arrived in China, and the bridge approaches, including steelwork and machinery, are to be transported to China shortly. The negotiations in China for these were conducted by Messrs. Arnhold & Co., Ltd. acting in conjunction with Messrs. A. Cameron & Co. (China), Ltd., agents for Messrs. Dorman, Long. In connection with these contracts Sir Alexander Gibb and Partners are acting as consulting engineers and the steelwork is being rolled and fabricated by Messrs. Dorman, Long & Co., Ltd. at Middlesbrough. The machinery and electrical equipment are being supplied by Messrs. Thomas Broadbent & Sons, Ltd., who have recently joined the group of firms comprised in Messrs. Dorman, Long & Associates (China), Ltd. The foundations and the erection of the steel bridgework are being carried out by the Chinese Government Railways.

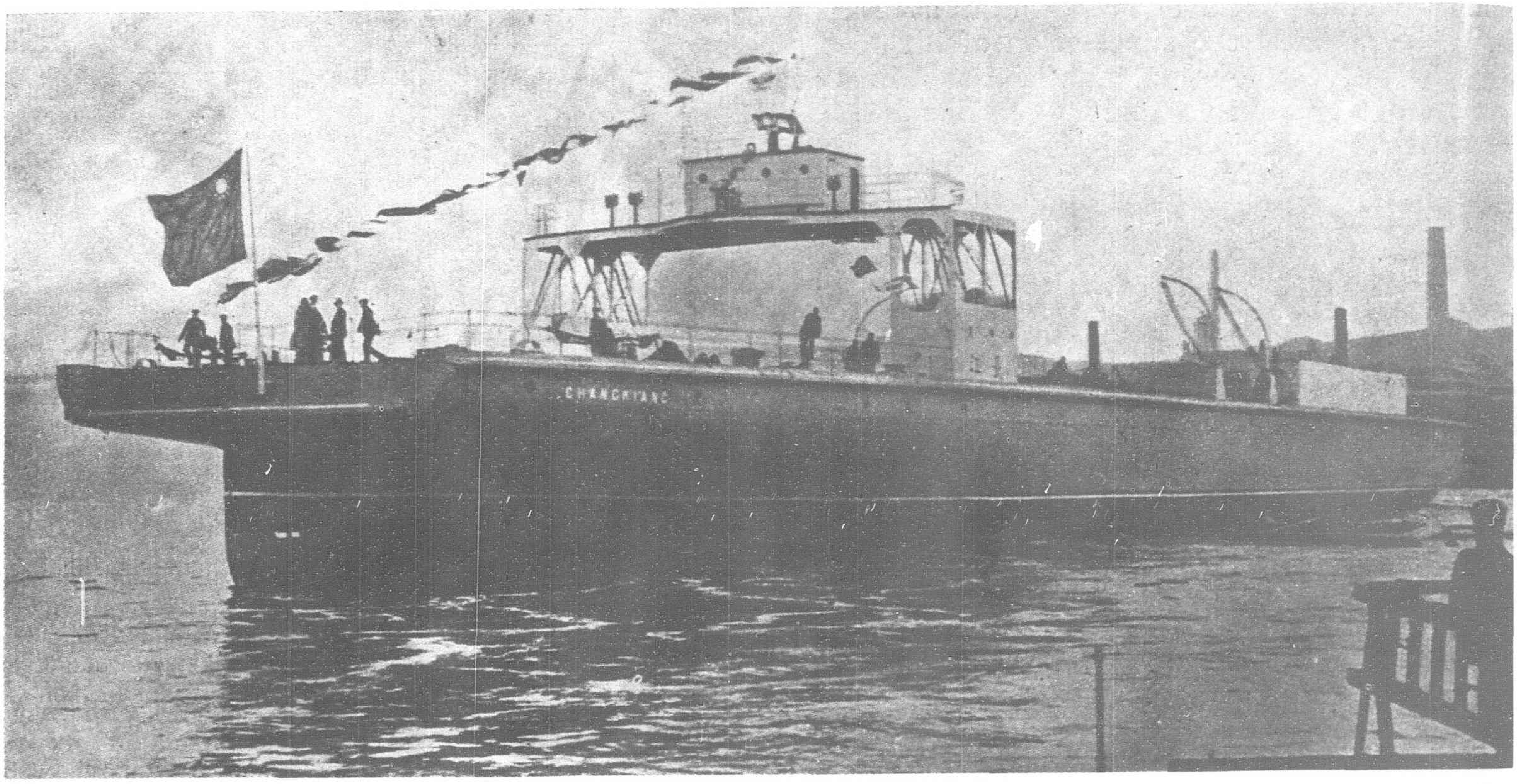
With regard to the arrival in China of the train ferry *Changkiang* some time ahead of the arrival of the bridge approaches and steelwork it is to be explained that the contractors' drawings for these were not given official approval until October, 1932, whereas the contract for the ferry steamer was signed seven months earlier. Actually, Messrs. Dorman, Long's deliveries of the bridgework are being made ahead of contract time.

The photograph below, taken at the Middlesbrough works of Messrs. Dorman, Long & Co., Ltd., where the bridgework is being fabricated shows one of the movable spans for the bridge terminals of the train ferry. The object of this undertaking is to carry freight and passenger trains across the Yangtze River, the bridge approaches giving access to the ferry steamer having to make provision for a maximum variation of 25 feet in the water level during the year and for daily variations due to rise and fall of tide of between one and three feet. The bridge approaches are identical on each side of the river. The bridge consists of three spans of 154 feet and one of 152 feet and in the following description these are referred to as Nos. 1, 2, 3 and 4 from river to shore.

Spans 2, 3 and 4 are 20 feet wide center to center of trusses while No. 1 flares out to 44 feet. A single railway track is carried at the shore end, which branches out on span No. 1 into three, providing for shunting trucks on to the three tracks on the ferry boat. The fourth, or shore span, is hinged at its shore end, while its outer end is connected by pin joints to the inner end of the third span. These pins also carry links and large nuts in which a screw rotates. The junctions between each span are provided with similar nuts, pins and screws, as in the outer end of span No. 1. Two screws, one at each side of the bridge, are carried on a steel tower at each



One of the movable spans for the bridge terminals of the Nanking-Pukow Train Ferry being fabricated at the Middlesbrough Works of Messrs. Dorman, Long & Co., Ltd.



The Train Ferry steamer "Changkiang" at it took the water at Newcastle-on-Tyne, October 12, 1932, at the Neptune Works of Messrs. Swan, Hunter and Wigham Richardson, Ltd.

pier and are electrically driven through suitable gearing so that the fourth, third and second spans may be raised or lowered simultaneously by the correct amount to produce a uniform slope from shore to the outer end of the second span to suit the level of the water.

The first, or riverward, span is always maintained in a horizontal position for greater safety in handling the railway traffic. Connection between the riverward span and the ferry boat is made by a steel apron hinged to the span. This apron may be raised or lowered by electrical gear and when resting on the stern of the steamer it engages with a heavy cast steel guide which maintains the position of the boat relative to the apron during the loading operation. The hinged apron takes up any difference in level in the ferry boat when loading, and hinged and sliding rail joints connect railway tracks on the apron and on the boat.

All the machinery is electrically interlocked so that the operator can only carry out the various operations on the correct order. Thus he will first adjust the bridge to the correct level and lower the apron on the steamer. Until the apron is correctly locked in position on its guide, the barrier gate across the end of the span cannot be raised to allow the trucks to be run off the bridge. In the event of the ferry boat moving away while the barrier gate is open, it will close automatically, a warning gong sounding the whole time the gate is closing. Hand operating gear is arranged for all the machinery in case of a failure of the electric power.

The train ferry *Changkiang* was launched on October 12 last from the Neptune Works of Messrs. Swan, Hunter and Wigham Richardson, Ltd. in the presence of a distinguished gathering. Madame Quo Tai-chi, wife of the Chinese Minister in London, christened the vessel as it left the ways. The *Changkiang*, which arrived in Shanghai last May, is a twin-screw vessel designed for the transportation of freight and passenger trains and is capable of transporting 21 passenger cars simultaneously, making possible for the first time through railway traffic linking Shanghai and Peiping. The work of building the vessel and its propelling machinery was carried out under the supervision of Sir John H. Biles and Co. of London and negotiations in China in connection with the construction of the ferry were carried out through Messrs. Malcolm and Co. of Shanghai, acting as agents for the builders *

The principal dimensions are about 372 feet overall, an extreme breadth over the belting of 58½ feet ; and hull and machinery have been built under Lloyd's special survey for their Class 100 A.1. The ship is designed to carry a total live load of about 1,200 tons, and a total deadweight of 1,550 tons.

On the upper deck there are three clear lengths of car track, each 300 feet long, taking in all three trains each of seven wagons. The cars will be shipped from the forward end, the connection between the shore and the ship being made by an approach bridge of four spans about 20 feet wide between the trusses, and widening out on the deck of the ship.

The operation of leading the wagons will be by a shunting locomotive carried on the ferry at the after end of the upper deck, working in conjunction with traversing gear by means of which the locomotive may be moved horizontally across the deck to enable it to operate on any of the three lines of rails. At the after end of this deck and in line with each car track, substantially supported buffers were built.

The forward end of the upper deck is recessed in an athwartship direction to receive the apron, which in its working position will be flush with the upper deck, connecting the railway track on the shore with the three lines of track on the deck of the ferry. To facilitate berthing there is, in addition to the after steering arrangements, a bow rudder with its independent steam steering gear for use in manoeuvring in and out of the berthed positions.

The propelling machinery is amidships with the casings arranged at the sides of the upper deck, and a coal bunker is provided in a recess between the two boilers. The

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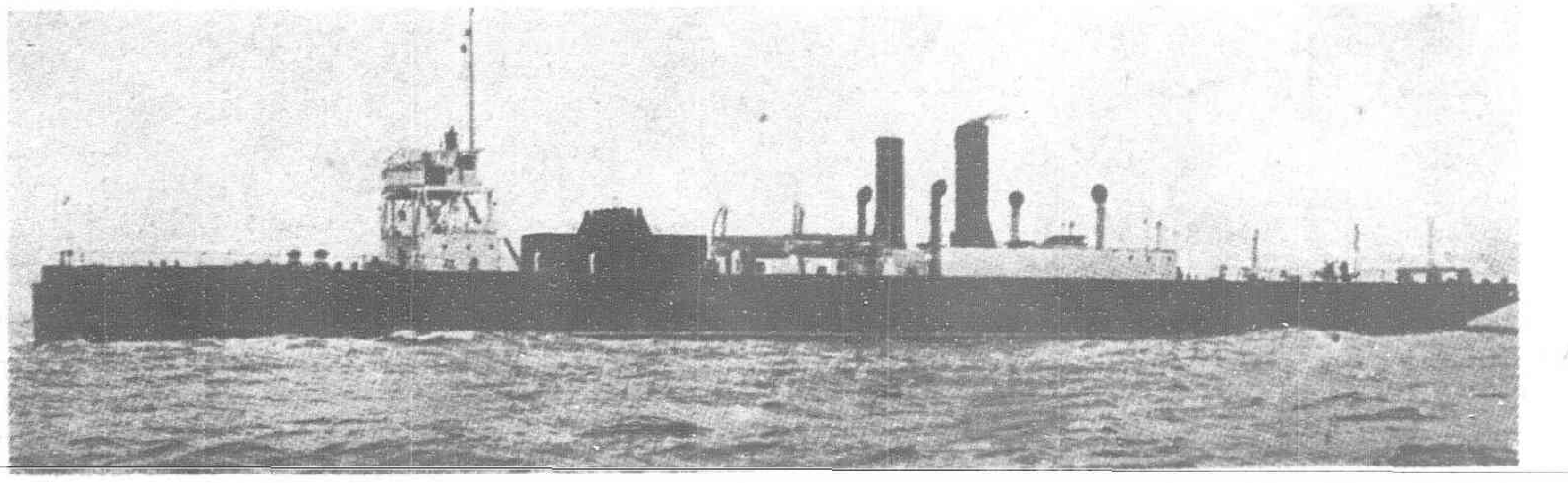

The Train Ferry steamer "Changkiang" as it appeared on its arrival in Shanghai in May, 1933

**Far Eastern Review*, June, 1932

Carrier Current Telephony on Long Distance Lines in Malaya*

By *A. H. CARSON, A.M.I.E.E.,A.M.I.Rad.E.*

The following article does not aim at being a technical treatise, but rather is an attempt to explain, as far as possible in a non-technical way, the principles of trunk line telephony, as applied to Malaya, with particular reference to the operation and application of Carrier Current Telephony as the solution of a local trunk telephone problem.

Until the advent of the loading of telephone cable circuits, of telephone repeaters, and later of Carrier Current telephone and telegraph systems, there had, of necessity, to be periods of stagnation in telephone development in many countries of the world. This was largely due to the inability of existing aerial lines adequately to cater for the ever increasing demand for trunk telephone facilities. Added to this a further difficulty was due to the inability of unloaded cable circuits, because of their transmission limitations, to take care of that demand. It was not until a satisfactory system of loading telephone cable circuits was devised and thermionic valve repeaters were perfected that it was possible to make full commercial use of underground circuits. For trunk telephone purposes in countries such as Great Britain cables are used almost exclusively between big centers for long distance communication.

In this connection many administrations are still faced with the problem of the advisability of changing over from long distance aerial trunk lines to underground loaded and repeater cable circuits which are capable of providing better and more reliable speech channels. In contemplating such changes there are points that must of necessity be given very careful consideration, and chief of these is usually the question of the economics of the provision and maintenance of long distance underground cables as opposed to the construction of additional pole lines, or the re-construction of existing pole lines to increase their carrying capacity.

In such cases the application of carrier telephone and telegraph channels over existing lines makes problems of that kind more easy of solution in so far as by the use of these systems the saturation point of pole lines, in terms of the carrying capacity of speech channels, can be extended to such limits that the transition from aerial lines to long distance cable working is usually much more justifiable than it would otherwise be.

Development of the Telephone System of Malaya

Like all other branches of the public service, the telephone system of Malaya had grown in an extraordinary manner in post-War days, and in growing so rapidly a fairly large trunk network had to be provided on aerial pole lines which were not in the first instance designed to carry such heavy loads as latterly had been imposed upon them. The normal condition of affairs had always been that the demand for trunk communication was of such magnitude compared with the available facilities, that considerable delay on all trunk calls was in the natural order of things. In many cases where demand for trunk service had existed it had not been possible to provide communication facilities. Nothing could be done to alleviate this condition of affairs during the period of the Great War, and even for some years afterwards, as so much difficulty was found in obtaining adequate supplies of stores that the demand for trunk communication more than ever got ahead of supply.

A very complete development study of the traffic position was prepared, and compared with a survey of the engineering possibilities of providing more lines. This study resulted in a

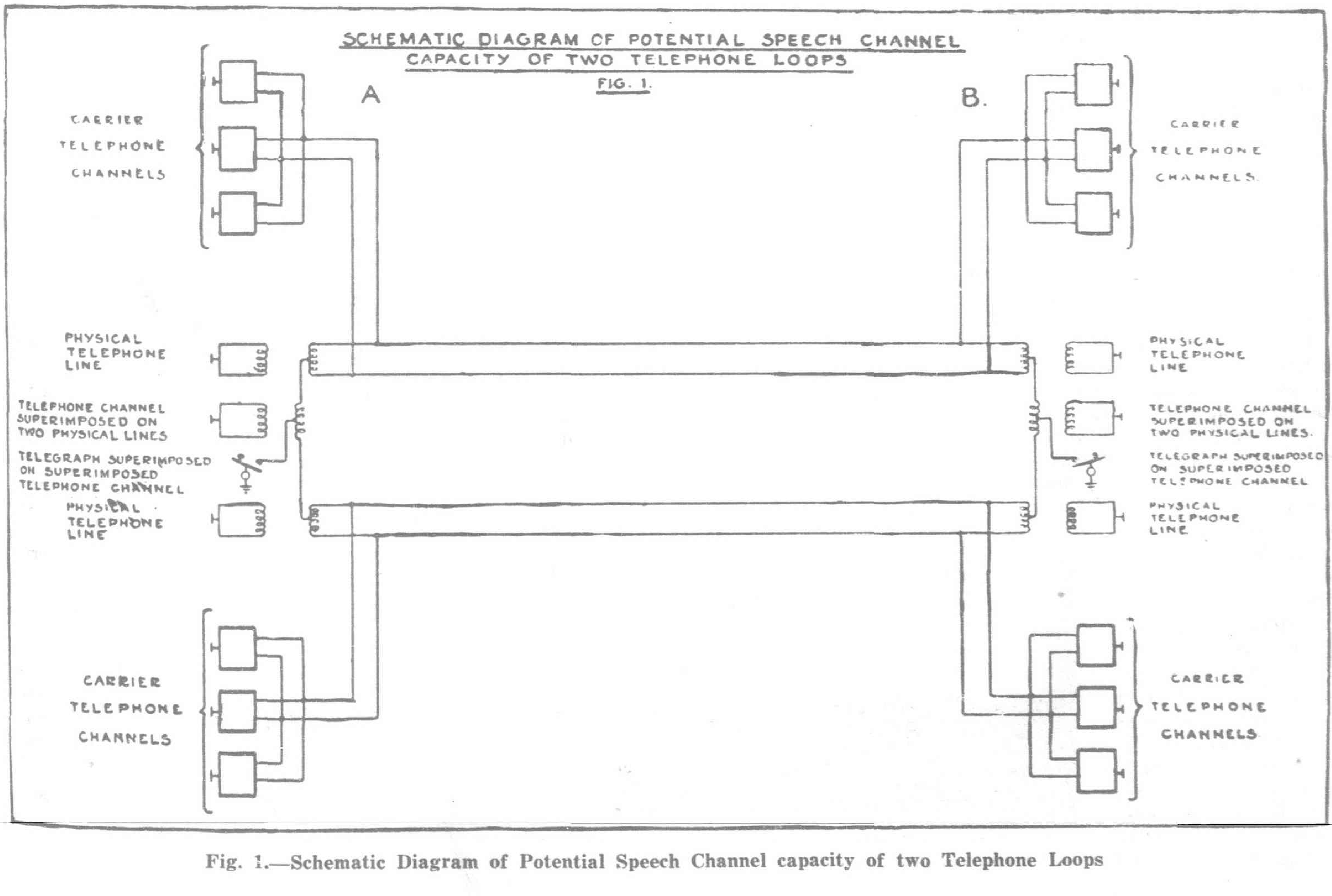
SCHEMATIC DIAGRAM OF POTENTIAL SPEECH CHANNEL
CAPACITY OF TWO TELEPHONE LOOPS
FIG. 1.
A
B.
CARRIER TELEPHONE CHANNELS
CARRIER TELEPHONE CHANNELS
PHYSICAL TELEPHONE LINE
TELEPHONE CHANNEL SUPERIMPOSED ON TWO PHYSICAL LINES
TELEGRAPH SUPERIMPOSED ON SUPERIMPOSED TELEPHONE CHANNEL
PHYSICAL TELEPHONE LINE
PHYSICAL TELEPHONE LINE
TELEPHONE CHANNEL SUPERIMPOSED ON TWO PHYSICAL LINES
TELEGRAPH SUPERIMPOSED ON SUPERIMPOSED TELEPHONE CHANNEL
PHYSICAL TELEPHONE LINE
CARRIER TELEPHONE CHANNELS
CARRIER TELEPHONE CHANNELS

Fig. 1.—Schematic Diagram of Potential Speech Channel capacity of two Telephone Loops

scheme being prepared and submitted to the respective Governments of the Straits Settlements and Federated Malay States for a complete underground trunk cable scheme to serve the whole of Malaya.

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*Quarterly Journal of The Engineering Association of Malaya

The cable proposed was to have provided fifty speech channels from end to end of the country, and although the scheme was actually approved, it had temporarily to be shelved and ways and means had then to be found of carrying on with existing facilities, or of finding some means of extending the existing system as long as that could be accomplished in an economical way.

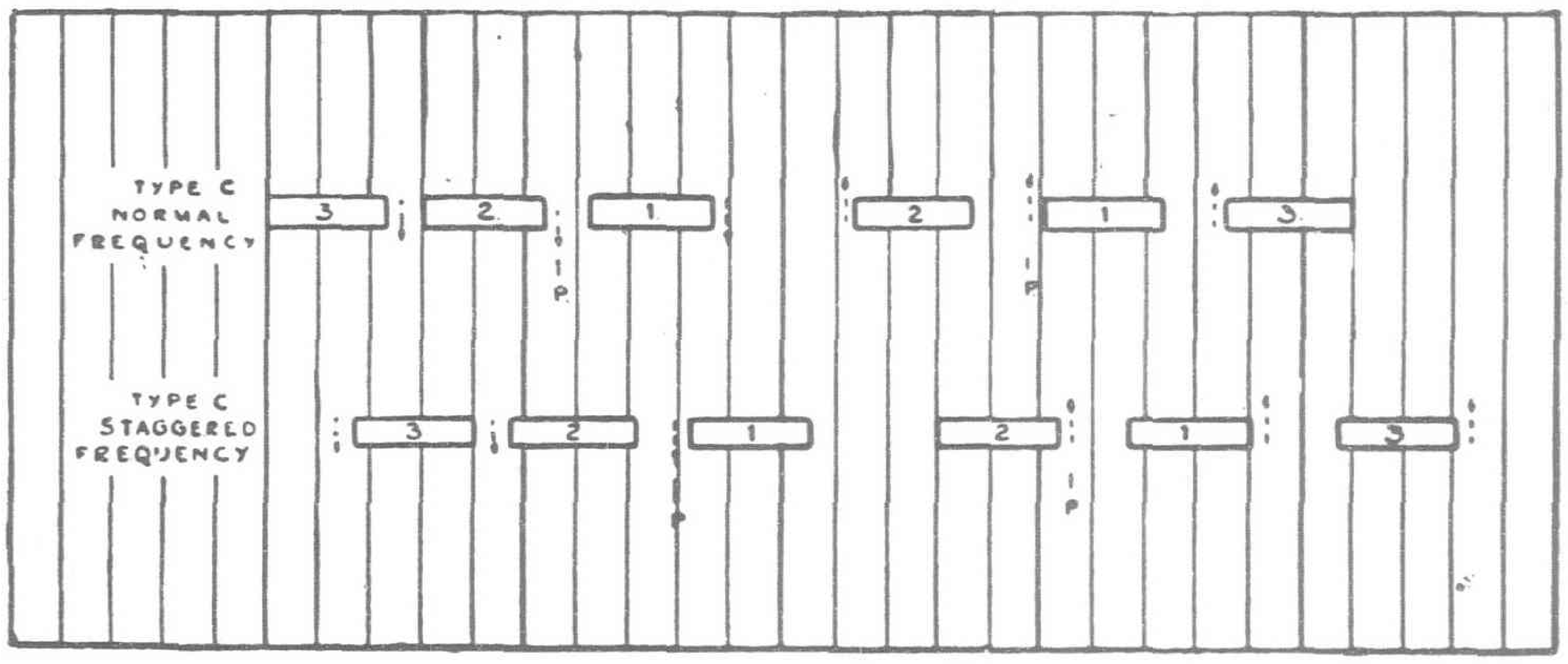


Fig. 2.—Frequency allocation of Type "C" Carrier System

The Main Trunk Line

The main trunk telephone pole line serving the Peninsula stands within the government Reserve of the main railway route. This pole line is constructed of sections of 25-ft. and 30-ft. iron poles, according to estimated load, and the poles are spaced on the average 70 yards apart. They are fitted with wooden cross arms which are drilled to take British Post Office pattern spindles and insulators. For all trunk and main telegraph lines 12-in. spacing between arms and also between insulators is standard practice.

The main pole line was rapidly becoming heavily overloaded in sections and to permit of further trunk development, until such time as the main trunk cable scheme could be proceeded with, two alternative schemes were open for consideration—(*a*) to build subsidiary trunk routes along the main roads to carry short distance trunk and junction lines, leaving the main route free for carrying long distance trunks only, or (*b*) to instal carrier telephone systems on the long distance circuits of the existing trunk pole line.

It was appreciated that while alternative (*a*) could be accomplished and would be a successful means to the end in view, a considerable amount of reconstruction, as well as of new construction, would be involved, which would be extremely costly in labor and material, would take a considerable time to complete, and would have the effect of causing interruption to the existing service, during the period of reconstruction. Method (*b*) therefore presented the advantage of permitting increased facilities in much less time, at lower cost, and without interruption of the existing service, if the administration was prepared to take the risk of spending a large sum of money on equipment of a type which had not previously been used on lines in any similar country, and regarding which there were no reliable data concerning its performance under full tropical conditions.

A compromise between the two methods was finally decided upon, namely, to provide long distance trunk facilities by means of carrier telephone systems on existing lines on the main pole route, and to provide relief for the overloaded condition of that pole line by constructing subsidiary pole lines on main roads, as and when required.

By this means it was possible to provide adequate trunk facilities to allow the trunk cable scheme to be delayed for several years with consequently a large saving in capital expenditure.

As a first step in the development of the scheme decided upon a C.S.3 type of carrier telephone system of Messrs. Standard Telephones and Cables manufacture was placed on order and was first put into service between Kuala Lumpur and Ipoh. This was the first plant of its kind to be tried out under full tropical conditions, as a consequence of which much valuable experience was gained concerning the operation of high frequency telephone equipment when opposed to the rigors of the Malayan climate.

The problem of trunk telephone communication in Malaya is rendered less difficult than it might be because of the fact that all the principle towns are situated on the West Coast of the Peninsula in such a way that one Main Artery is all that is really essential for the main telephonic communication of the country.

Zone Center Scheme

This arrangement of main towns in line permits of the application of a Zone Center Scheme of operation of the trunk telephone

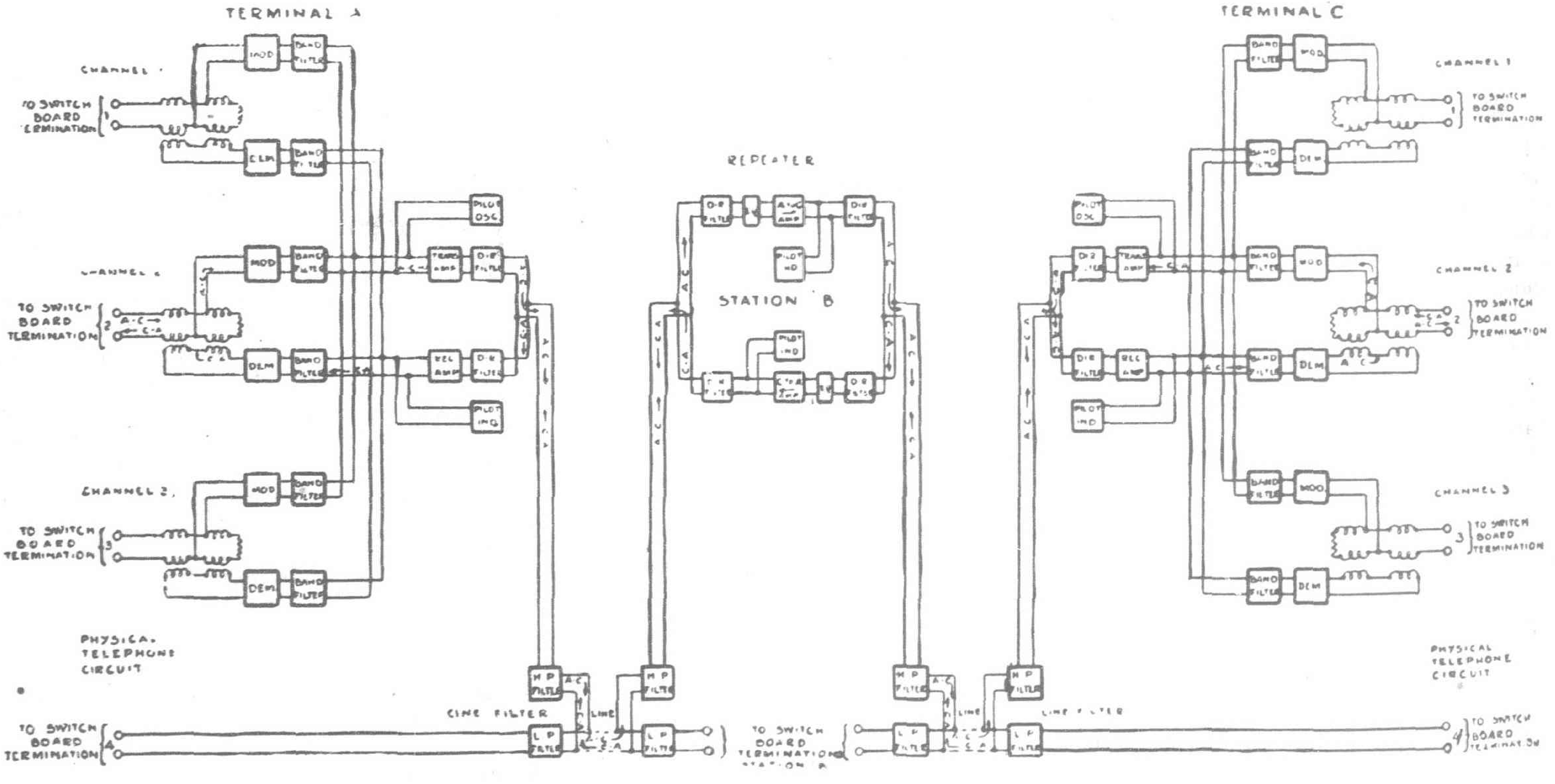


Fig. 3.—Schematic arrangement of complete Carrier System

system, which ensures that any one subscriber in Malaya may communicate with any other subscriber in the country within speech transmission limits which will ensure a reasonably good and reliable standard of commercial communication.

Briefly, the arrangement is that the principal telephonic centers of the country, which are Singapore, Tampin, Kuala Lumpur, Ipoh, and Bukit Mertajam, are all in direct communication with one another, and to these main centers are connected either directly, or indirectly, with one intervening exchange, all the other exchanges in the country.

From the foregoing it will be understood that the communication channels between zone centers must be of the highest possible standard of efficiency. They must operate within limits of transmission loss which must not be greater than one-third of the maximum transmission loss permissible between any two subscribers telephones which may be connected to one another over the system.

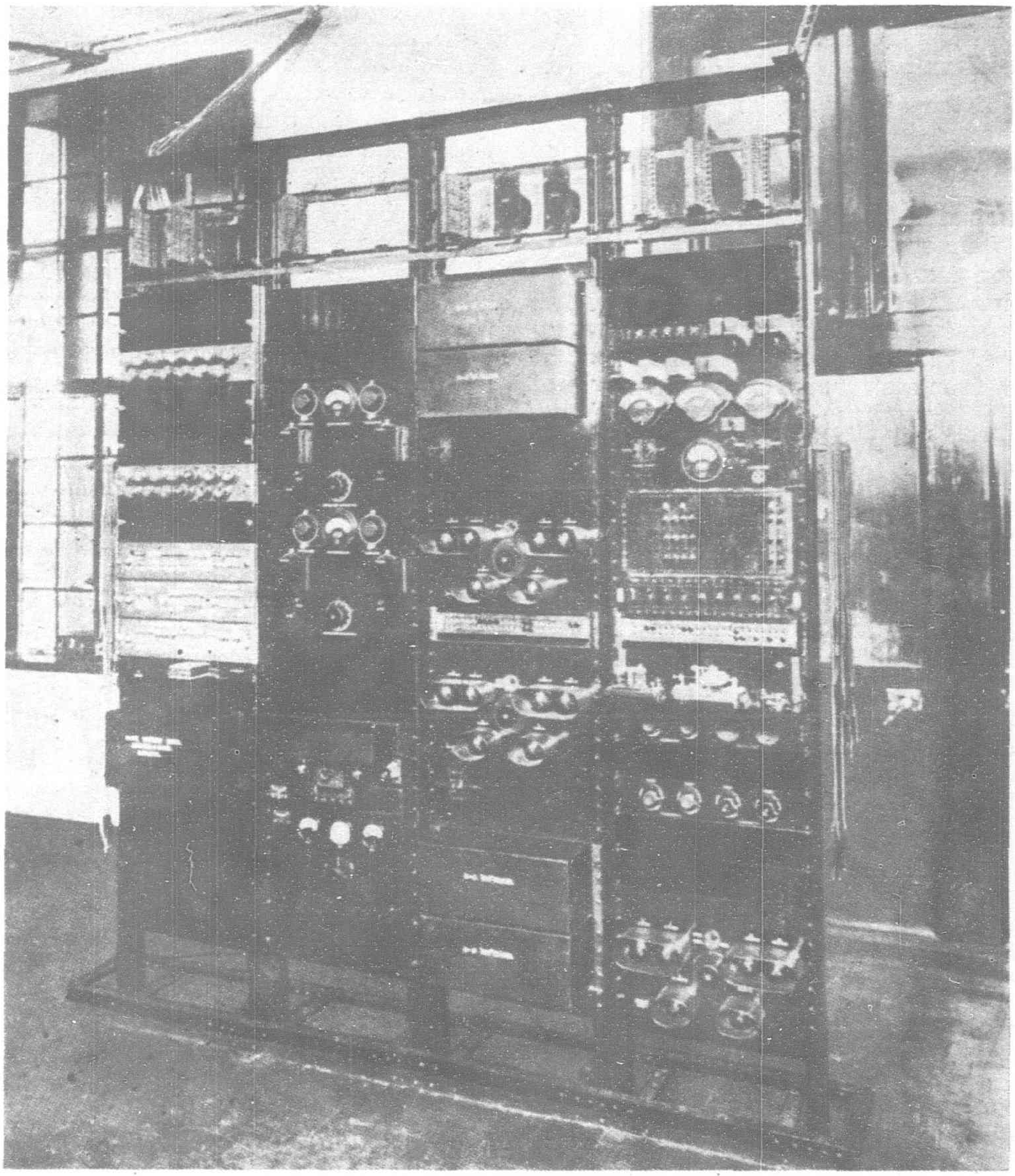


Fig. 4.—Carrier Current Repeater Equipment, Kuala Lumpur

The Application of Carrier Telephony to Existing Lines

For the provision of speech channels between the Malayan zone centers, carrier current telephony provides undoubted advantages over ordinary line telephony, not only from an economic point of view but because carrier channels provide a more efficient medium of speech transmission than ordinary metallic telephone lines.

It will be seen from Fig. 1 how, by superimposition of circuits and by the operation of Carrier telephone systems on existing lines, it is possible to operate nine high grade speech channels plus one superimposed telegraph circuit over four wires. It must however, in fairness to older methods, be indicated that the cost of three channel carrier current terminal equipment is such that it is at present only economical to use it where the distance separating terminals is greater than one hundred miles—over shorter distances it is usually more economical to erect wires.

Carrier Current telephony, or as it is sometimes more appropriately designated "Wired Wireless," is a system whereby one or more, up to a limit of three, additional speech channels can be provided on one pair of wires. It depends to a great extent for its successful operation on the ability of properly designed electrical filters to pass or oppose, as the case may be, particular frequency bands. To a lesser extent its successful application depends on the limited speech frequency of the talking voice which, as a rule, does not exceed a frequency limit of 3,000 periods per second.

In an ordinary telephone circuit each frequency component in the voice of the speaker is transmitted by an electrical current of the same frequency, and in most cases the electrical equipment of the circuit is not called upon to transmit frequencies above about 3,000-cycles per second. In Carrier Current operation, however, the voice frequency currents are caused to modulate high frequency currents which thus serve as Carriers for the message. By using two different frequency bands for each speech channel i.e. one frequency band for transmission in each direction, up to three Carrier channels can be provided to operate on a multiplex basis on one conducting pair of wires. A serious problem which is associated with the operation of several carrier systems operating on physical circuits on the same pole line is due to the high inductive effect of Carrier frequency currents on adjacent lines on which other Carrier systems are operated. As an instance of this it was discovered in the early days of "Carrier" in Malaya that the only system in use at that time, was connected for a period of six weeks to No. 1 physical line at Kuala Lumpur, and to No. 2 line at Ipoh, without anyone being aware of the fact until the need arose one day to carry out tests on the physical lines.

To overcome this difficulty of inductive cross talk, carrier plant is manufactured to operate on two different sets of frequencies which are staggered with respect to one another, so that it must always be arranged as far as possible that where two systems overlap between two terminals, one of these systems must be of the normal frequency type and the other must use different frequencies staggered with respect to the first one.

The frequency bands normally in use are shown diagramatically in Fig. 2. The arrows in the drawing indicate the Carrier frequency generated, also its direction, and the blocks show the side band frequency used in each case for transmission. It will be seen that each system uses six side band frequencies—i.e. one for each side of the conversation to be transmitted over each channel—or one sub-frequency band to carry the voice of each subscriber using the speech channels. At this stage it should also be noted that the groups of sub-frequencies of each channel form two wider frequency band groups for the directional transmissions of each of the complete systems.

In addition to using staggered frequencies as an aid to overcoming inductive interference, it is also necessary to transpose the lines at frequent intervals in accordance with a very elaborate scheme of line balancing designed to neutralize induction. As an indication of how really troublesome these inductive effects have proved in practice in Malaya there have been several instances in which it has been necessary to shift poles only three or four yards in order to balance the lines by crossing within the narrow limits of efficiency permissible.

Operation of Carrier Current System with Midway Repeater

Fig. 3 is a schematic drawing of two Carrier terminals connected to physical telephone lines on which midway repeater equipment is installed. It is hoped with the aid of this diagram and the explanation which follows to provide a clear indication of how the system works.

The physical lines shown as channel No. 4 in the diagram extend as separate circuits from Terminal A to Station B and again from Station B to Terminal C. It will be noticed that these lines pass through low pass filters where they are terminated. The purpose of those low pass filters is to permit the passage of audio frequency only and to prevent the passage through them of frequency currents beyond a range of 3,000-cycles, thus ensuring that there shall not be any interference by high frequency currents on any conversation that may be in progress on these lines.

As the terminating equipment for all Carrier channels is similar, in tracing the paths taken by speech currents it is necessary only to deal with one channel and for that reason channel 2, over which arrows have been inserted in the drawing indicating the direction of transmitted and received speech currents, may be considered.

The hybrid coil, common to each channel, is the dividing point between outgoing and incoming sources of currents between the carrier system and any physical circuit to which the system might be connected. By virtue of the special arrangement of its balanced windings it separates transmitted from received speech currents and as such it is the first directional item of plant encountered in the system. The speech transmitted from a Subscriber's telephone at Terminal A passes through the windings of the hybrid coil, thence from the center point of that unit to the modulator of the Associated Channel.

The next piece of equipment common to each speech channel is the modulator with its associated oscillator. It is the function of the modulator oscillator to provide a source of Carrier current supply for the transmissions from each channel at a predetermined frequency. It is also a very necessary part of that function to maintain the frequency at a constant level which shall not vary by more than 10 to 15-cycles in the case of an oscillator operating at 27,500 cycles per second. These oscillators are of the valve type and it is now possible, due to the advance in valve design, to ensure that oscillators which have to operate synchronously at both ends of a system will maintain their standard frequencies for fairly long periods without the aid of any synchronizing device. In practice, in Malaya, it has been found necessary only to test the synchronization of these oscillators and to carry out slight adjustments once a week.

The transmitted speech currents having passed to the modulator from the hybird coil modulate the predetermined high frequency currents generated by the oscillator described above, and in turn pass from the modulator to the band pass filter of the speech channel concèrned.

These band pass filters are composed of inductance coils and condensers wired in such a way that they will permit passage of currents only within a predetermined range of frequency.

It is the function of the band pass filter of each channel to permit the passage through it of the modulated side band of the carrier generated by the modulator oscillator and to suppress the carrier and all unwanted frequencies which if allowed to pass to line would give rise to cross talk and objectionable background noises.

It is one of the chief advantages of the system under review that the Carrier is not transmitted to line. Instead only one side band is used thus permitting the transmission of signals over a very much narrower frequency band than would be the case if the carrier were transmitted. This system in turn has the advantage that it permits more channels to be used on one pair of wires,

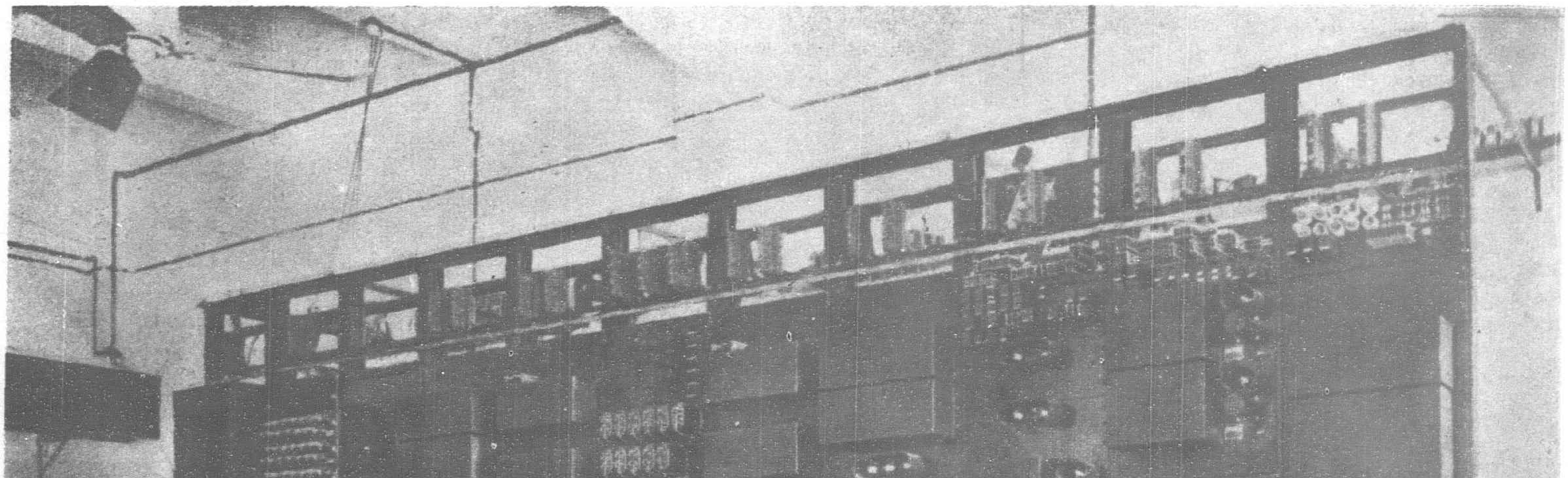


Fig. 5.—Carrier Current Equipment of the Ipoh Terminal

is much less likely to cause cross talk to other lines and systems, and provides a medium of transmission of a much higher quality.

Amplification of the Currents

The next stage is the amplification of the currents which pass through the band pass filters. This is done by a transmitting amplifier unit which is common to all three speech channels.

The amplifier in question is much the same in principal as the amplifying portion of wireless receivers, or as amplifiers used in connection with electrical gramaphones. It deals with the speech output in the transmitting direction of all three carrier channels, and its amplification output can be varied over a fairly wide range. In practice the amplifier is set at a predetermined gain and its associated potentiometer is not used except when tests are being carried out or unless some fault occurs on the system rendering additional amplification of transmitted speech currents necessary. As there is also a receiving amplifier (to be described later), embodied in the system the total transmission gain is shared between the two amplifiers, a method which ensures purer transmission of signals than would be possible were amplification carried out only at one end or the other.

Having now arrived at a stage of producing three separate modulated and amplified sub-frequency bands which have become one wide frequency band ready to pass to line and thereafter to distant terminal, it is still necessary that two further filters should be passed through.

The first of these filters follows the transmitting amplifier, and its function, being directional, is to pass the band of transmitted frequencies from the " A " terminal outwards and to oppose the band of frequencies being received at the " A " terminal from the " C " terminal. In other words the directionel filters on the transmitting and receiving sides on both terminals discriminate between, and pass only incoming or outgoing frequency bands respectively according to their setting.

The High Pass and Booster

The next filter, known as the High Pass, is so arranged that it passes all high frequency currents and opposes only audio frequency currents, thus separating and preventing any interference between ordinary speech frequency currents passing over the land line, and the higher frequency carrier currents multiplexed on the same pair of wires.

Passing along the line these transmitted currents from the "A" terminal, still within their predetermined frequency band, proceed on their uninterrupted course until they arrive at the " B " station where a repeater is installed as a booster or speech amplifier to increase the strength of the carrier current signal sent over the next stage of the circuits.

The Carrier frequency currents again encounter high and low pass filters across the line at the repeater station. As high frequency currents they are opposed by the low pass filter which only permit the passage of audio frequency and are therefore guided to and pass through the high pass filter which, as already explained, opposes and will not pass currents at audio frequency.

Having arrived at another point where there are two electrical paths in the " B " station repeater equipment the high frequency currents try both paths to find that they are accepted by one directional filter—i.e. the one leading to the A to C amplifier and cannot possibly get through the other directional filter guarding the C to A amplifier.

By the time these high frequency currents, although amplified in being transmitted to line, arrive at the repeater amplifier they have been considerably attenuated and should be well below zero value.

Repeater's Function

It is therefore the function of the repeater amplifier to boost up those currents, in much the same way as one amplifies weak radio signals,—passing them on to line with renewed energy, again through a directional filter.

From the repeater equipment the high frequency currents pass to line and in due course arrive at the " C " terminal, once again below a zero level of attenuation and in need of amplification to a commercial speech standard.

Being high frequency currents they pass through the " C " terminal high pass filter, thence through the receiving directional filter to the Receiving Amplifier.

The receiving amplifier is the same in principle as the transmitting amplifier and although its range is just as wide, and it is quite as powerful, it is not used to amplify to the same extent, as it is preferable to amplify more at the transmitting than at the Receiving terminal.

All frequencies having been mixed into one frequency band for amplification and transmission from the A terminal, it is now necessary to separate these sub-frequencies, guide them to their proper circuits and demodulate them, in order to pass intelligible speech to the correct switch-board termination.

The separation of the correct channel frequencies is undertaken by the band filters in front of the demodulators, as each is set within narrow limits to pass only the correct sub-frequency band of the channel with which it is associated.

The Demodulating Unit

The process of demodulation for each channel is carried out by a demodulating unit, with an associated oscillator, common to each channel. Its operation, although somewhat similar to the modulators on the transmitting side, differs in that its function is reversed—i.e. it translates from a high frequency band to a lower, instead of the reverse.

Speech which is once again intelligible, passes from the demodulator to the windings of the hybrid coil and to the switchboard where it is available for connection to other exchanges or direct to a subscriber's line.

So far the transmission of speech on Channel 2 in one direction has been considered, but as the transmission in the opposite direction is merely a reversal of the same order of things, only at a different frequency it is thought there is no need for any further detailed description of the process involved except perhaps to emphasize that when two subscribers are conversing over any one speech channel they are each modulating separate frequencies. It may be worthy of mention too that neither of them can be overheard by any-one tapping in on the lines.

Weather Interference

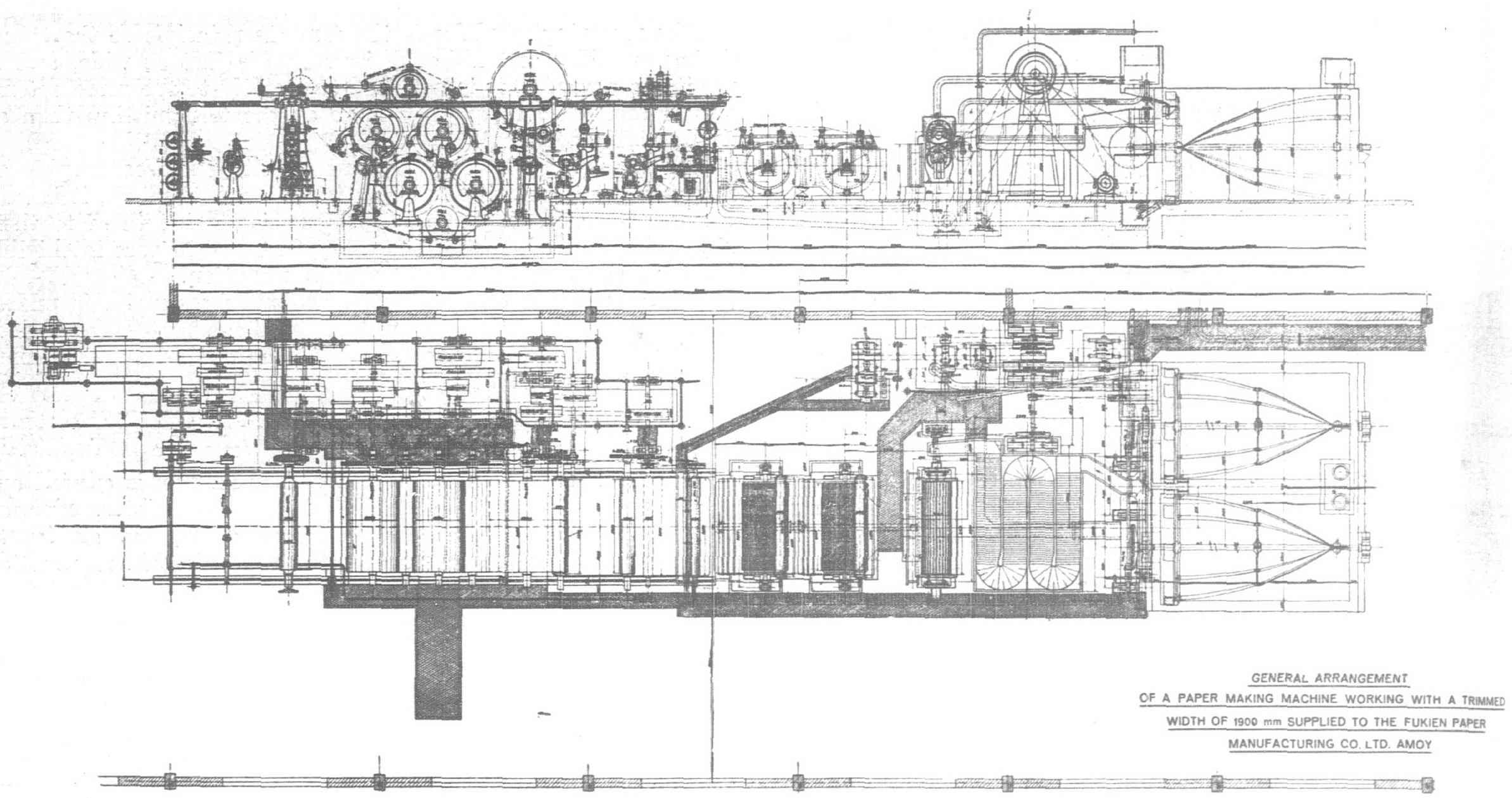
In view of the fact that weather conditions interfere to a marked degree with the stability of the transmission of high frequency currents over the lines due to leakage caused at insulators, etc., it is necessary to make adjustments at the terminals from time to time to compensate for varying line conditions. In practice in Malaya it has been possible to condense this matter of line up adjustment to a routine which is attended to twice daily if weather conditions are fairly normal.

In the case of the long distance channels in which repeater equipment is in circuit, a very clever method of providing an indication of the efficiency of the system has been evolved. Referring again to Fig. 3 it will be found that at each terminal a pilot oscillator is provided which sends yet another predetermined high frequency current to line. At the repeater stations *en route*, and at the distant terminal, the strength of the current received from the pilot oscillator is shown as a constant reading on a pilot indicator. By means of this pilot indicator it is possible to see at a glance the state of efficiency at which the system is operating. Should a variation of strength of signal from the pilot channel oscillator occur beyond the allowable limits of variation, an alarm bell comes into operation at the terminal concerned as a warning to the attendant that adjustments are necessary.

Ringing Signals

In addition to providing for the transmission of speech, carrier channels must also be capable of providing for the transmission of ringing signals for the purpose of attracting attention at distant terminals and for the proper supervision of traffic.

On normal telephone trunk circuits ringing is done by sending to line an alterating current of about 70-volts operating at 17-cycles per second. As it is difficult to transmit such low frequencies satisfactorily over carrier channels, special arrangements have to be made to raise the frequency of ringing signals to a point suitable for transmission over these channels. This is done by providing for the ordinary ringing current from exchanges to operate relays which switch on to the channels concerned a frequency signal of 1,000-cycles per second interrupted at 17-cycles per second. At the distant end this distinctive ringing signal is translated by apparatus designed to respond to very small currents of this character, but to discriminate sharply against other currents.



GENERAL ARRANGEMENT OF A PAPER MAKING MACHINE WORKING WITH A TRIMMED WIDTH OF 1900 mm SUPPLIED TO THE FUKIEN PAPER MANUFACTURING CO. LTD. AMOY

The Paper Mill of the Fukien Paper Manufacturing Company, Amoy in Foochow, China*

By O. BRAMATI

THE endeavor of all countries, particularly also Asiatic countries to render themselves more independent of other countries, has become more and more apparent during the past-war years. All countries are endeavoring to improve their international trade balance by reducing imports and by better utilization of the raw materials available in their own country. This was the reason for the foundation of the Fukien Paper Manufacturing Co., in Amoy during 1929, with the object of converting bamboo and reed grass growing in the South Chinese Province of Fukien into paper by means of an installation of up-to-date machinery. The Chinese business-men have earned the full appreciation of their own countrymen by tackling such a project and by bringing it to realization, considering the times of internal unrest, in a country, where most of the existing paper mills have adhered to traditional production of paper by hand as practised for many centuries.

The Escher Wyss Engineering Works have also been invited to tender and, following on the plans and drawings submitted, they received the order for the entire equipment of the paper mill for the provisional daily output of three tons.

Hand-in-hand with the study of the project it was determined, from these samples sent of raw material, coal and water, in the laboratories of the firm what processes and what boiler and filtering installation would be required in order to ensure satisfactory and economical operation.

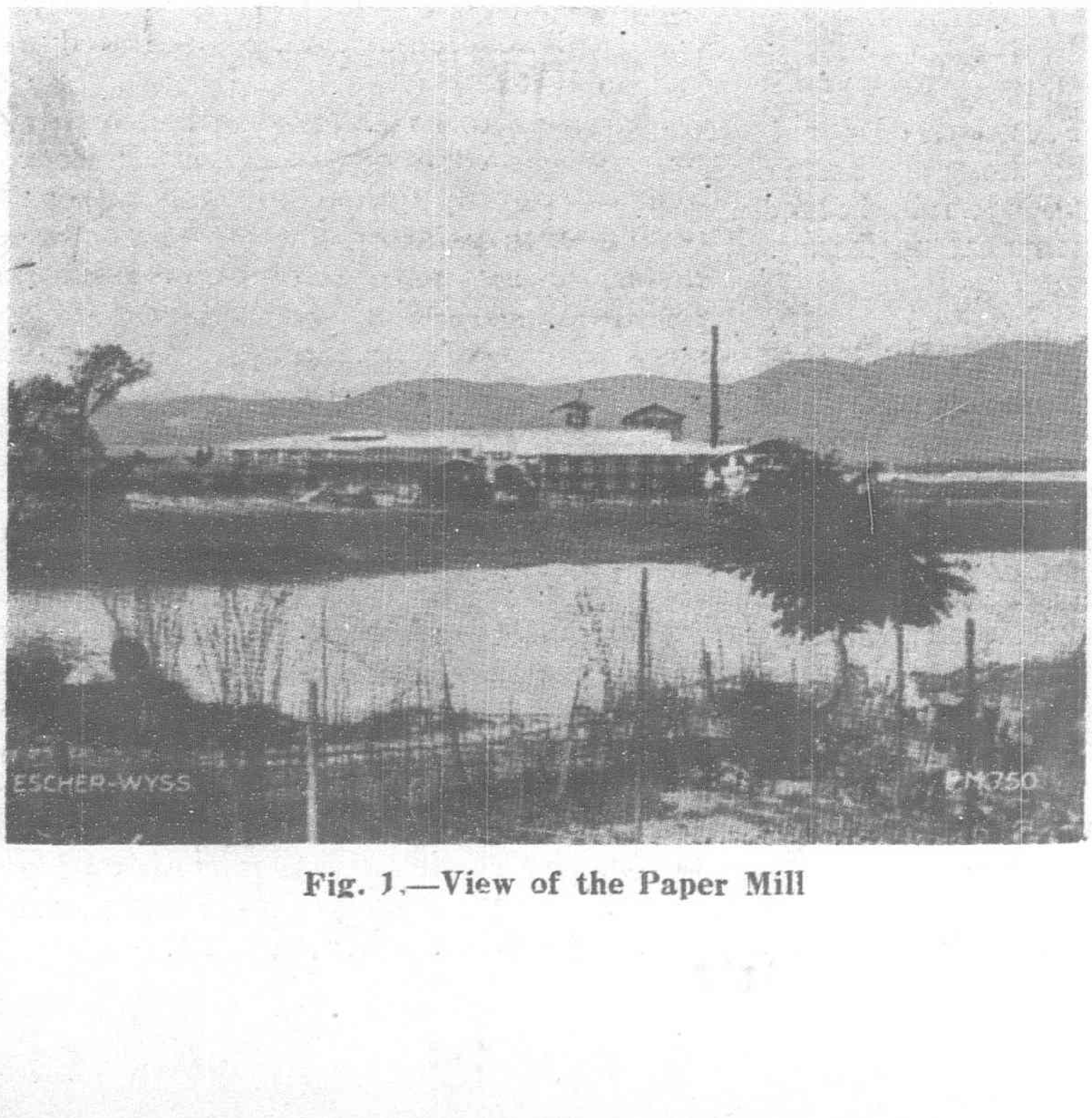


Fig. 1.—View of the Paper Mill

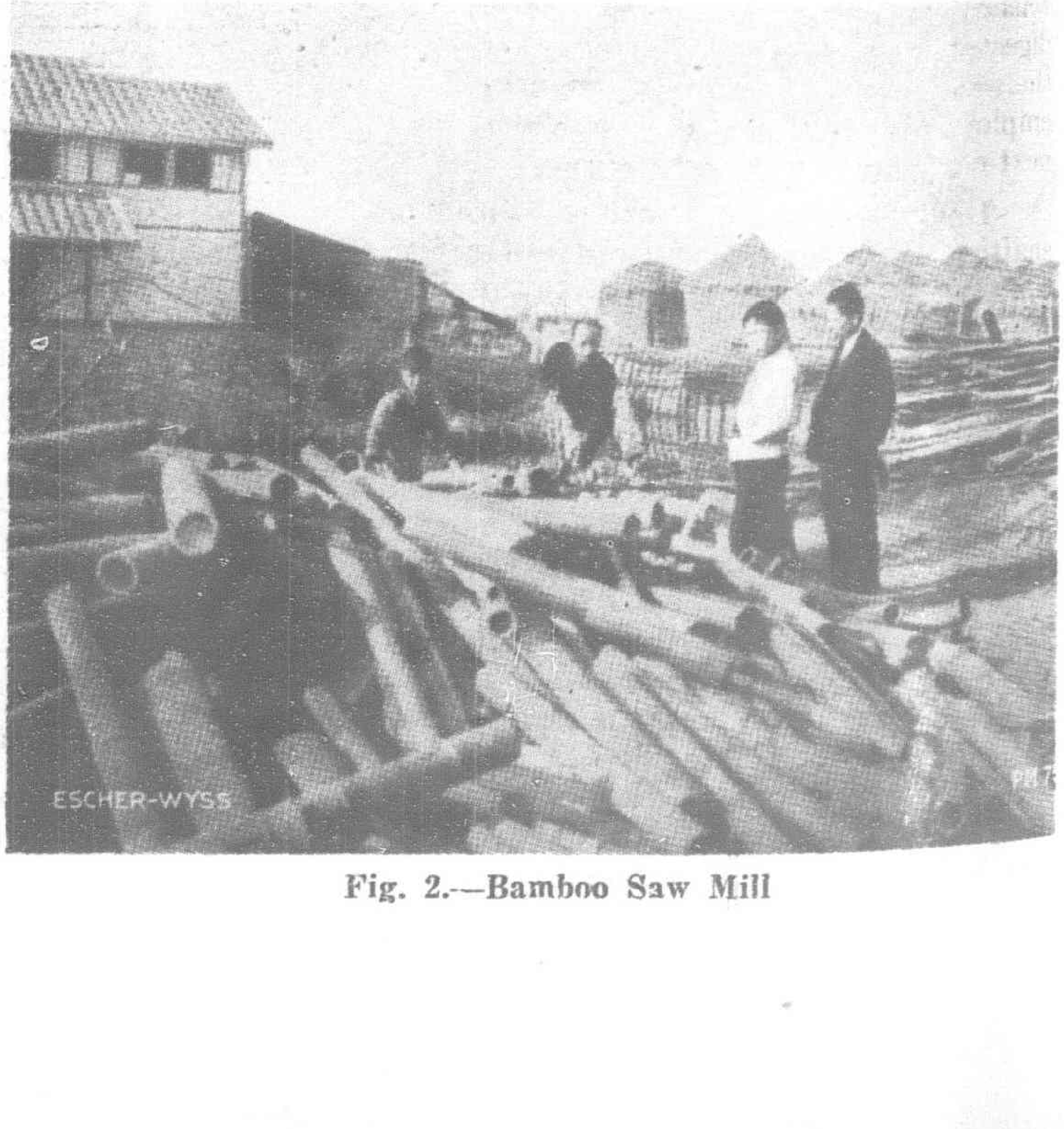


Fig. 2.—Bamboo Saw Mill

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*Escher-Wyss News.

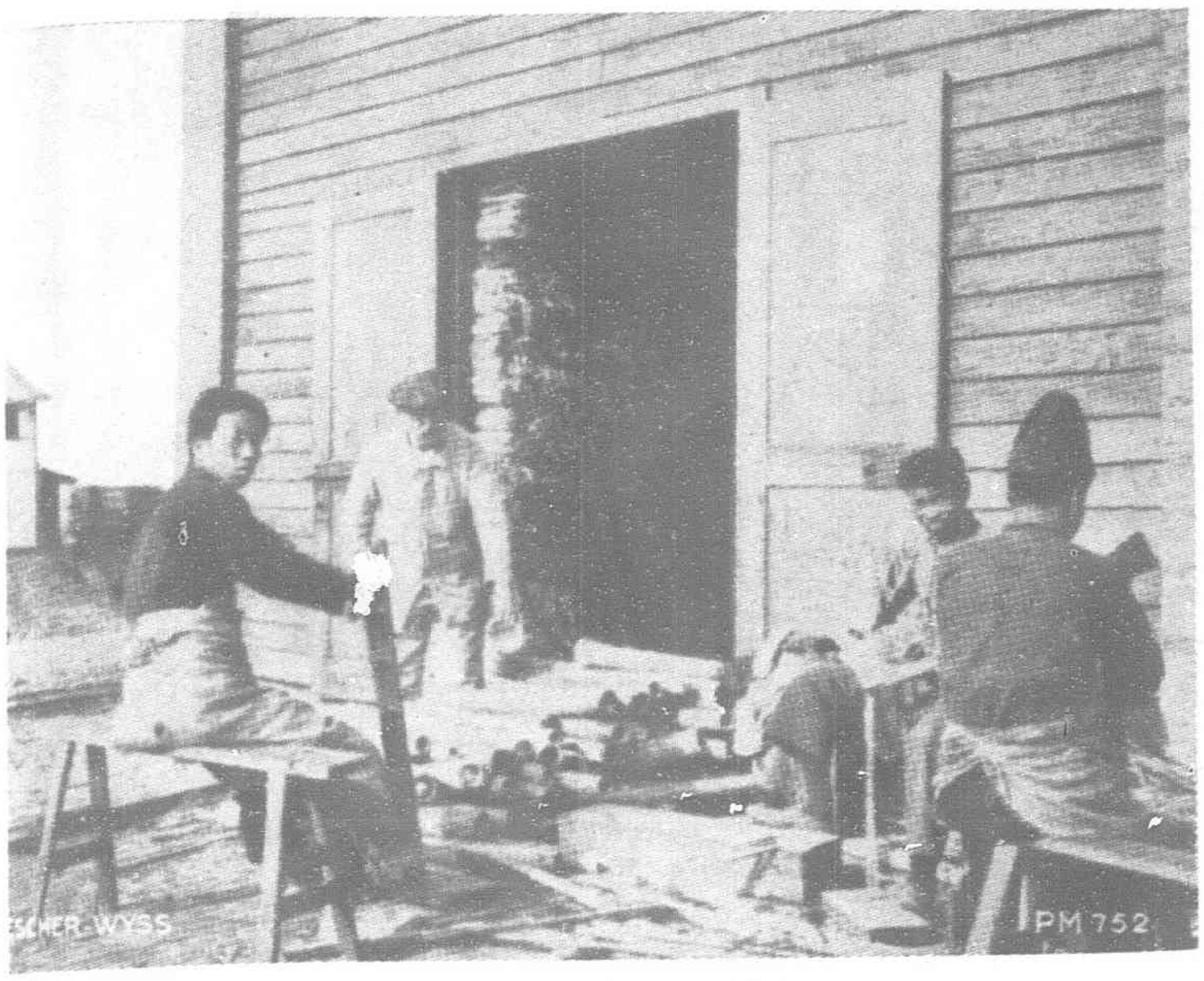

Fig. 3.--Bamboo Splitting

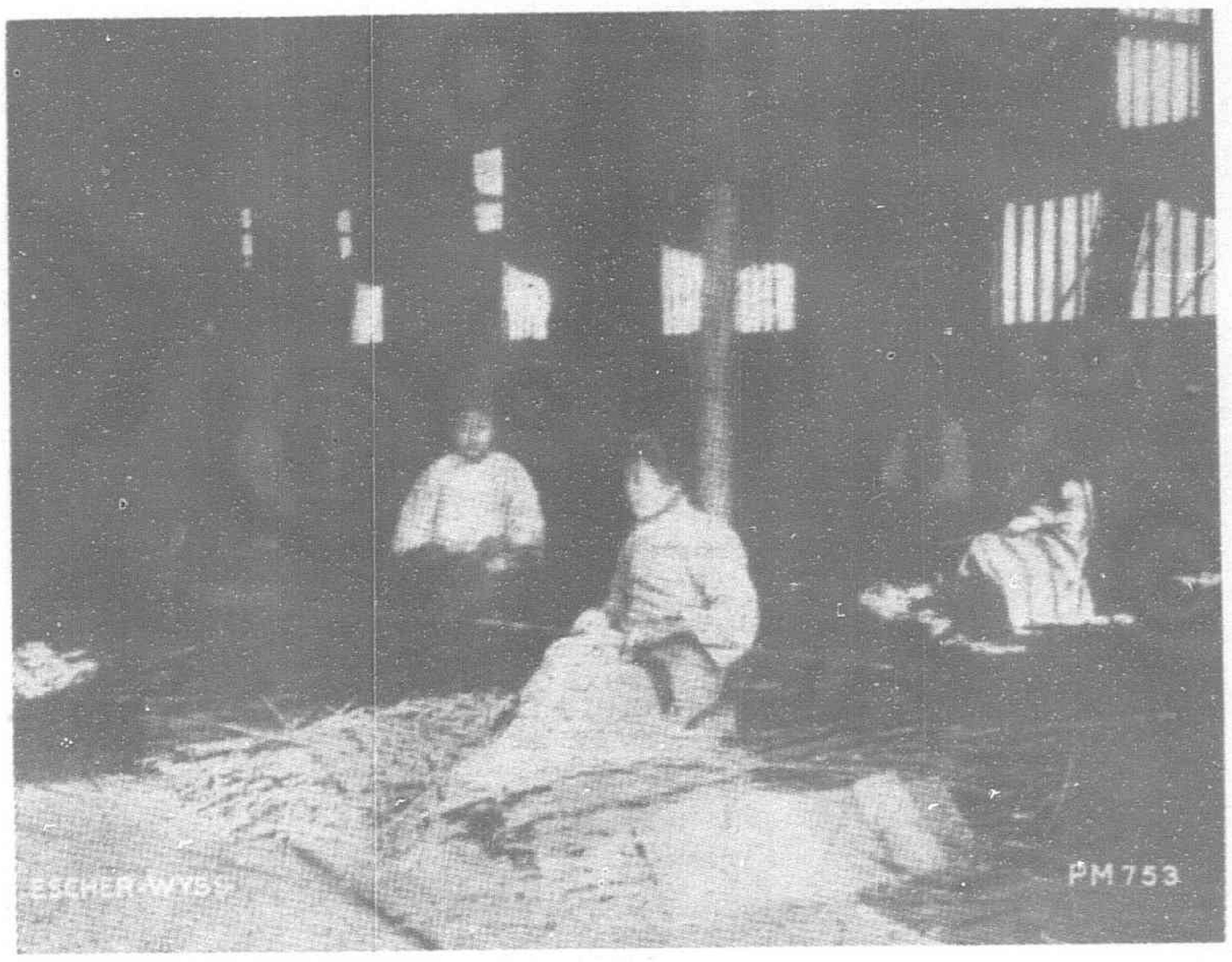

Fig. 4.—Reed Cleaning

Foochow, the capital city of the province was selected for the installation. There the River Minkiang with one of its tributaries forms an island on which a saw-mill has been in operation for some time. This site was selected because, on the one hand, the raw materials and the coal required could be shipped right to the mill by means of river and coastal steamers, and on the other hand, because of the nearness of the town numbering roughly 350,000 inhabitants which would guarantee a safe market for the output (see Fig. 1).

The raw materials will be disintegrated mechanically in a special building. Previous to this the bamboo rods which are being supplied to the mill in lengths of three to four meters and 10 to 12 cm. thick are sawn into pieces of one meter lengths (Fig. 2), then they are split longitudinally (Fig. 3); it must, however, be mentioned that the knots containing a high percentage of silicic acid, and which do not contain any valuable fibre, are not thrown out or eliminated. The reed grass is prepared by stripping off the blades (Fig. 4). The raw material is cut up by means of a chopping machine of similar construction as is being used by cellulose mills. This machine has been designed of very robust outlines, because the tests made in the laboratories have shown that the tensile strength of bamboo cane is not far short of that of steel. The small chips are carried by means of a belt-conveyor and a bucket-conveyor or elevator to the hopper room on the second floor of the disintegrator building.

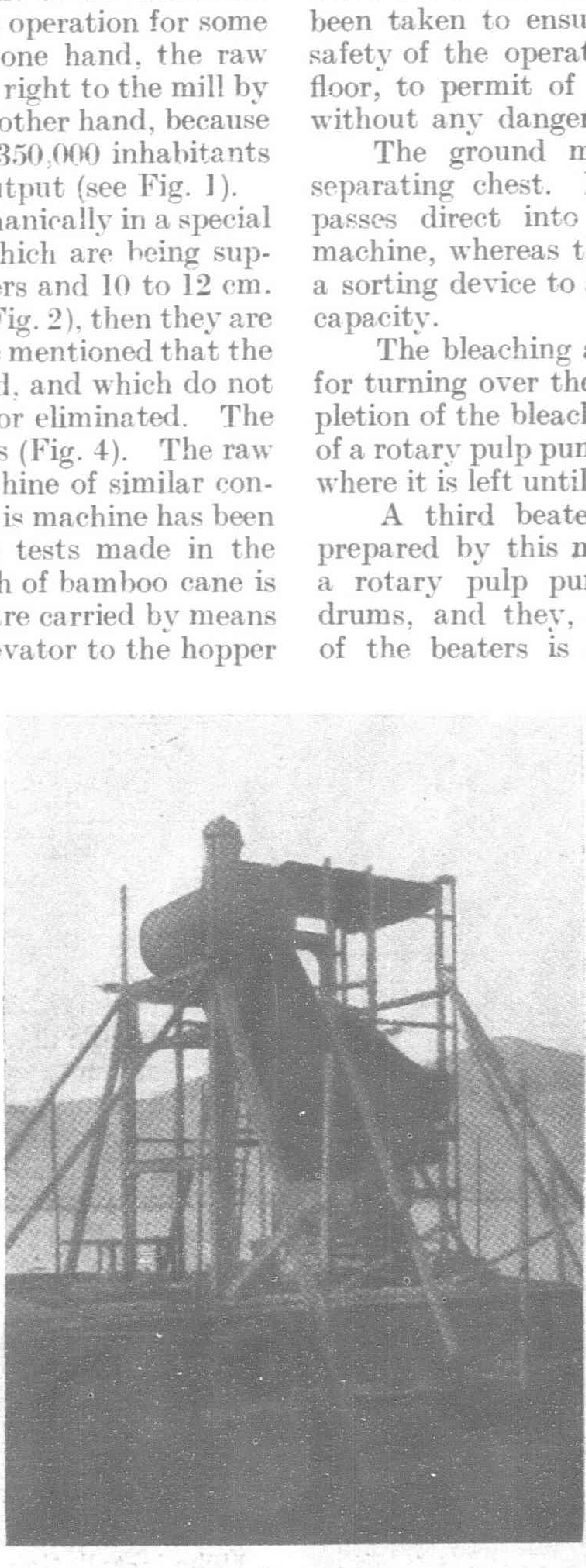

Fig. 7.—"Garbe" Boiler having a Heating Surface of 130 sq. meters. View during erection

The material will be boiled inside in two spherical digesters of 3,000 mm. diameter each (Fig. 5), with caustic liquor at about eight atm. pressure, after which it is discharged on the draining floor where it is washed at the same time. The spherical digesters are arranged in such a way that the waste liquor of the one digester can be employed for preliminary heating of the next charge in the other digester.

The digesters are driven from the shafting by way of a spur-wheel countershaft; they are kept in balance by special counter-weights, ensuring perfectly smooth running. The fittings for steam, lye and water are kept fairly large and they are provided with safety-and check-valves. Large size pressure gauges indicate at all times the pressure existing within the digester. From the draining floor the material is further crushed in two edge runners. The bowl of this machine has been designed in such a way that the material operated upon will be thoroughly mixed, without the employment of any scrapers or other similar means and that it will always be in front of the stones. These edge runners are being driven from underneath by an arrangement of bevel gears and by friction couplings which are fitted inside the driving pulleys. In this case particular care has been taken to ensure certainty of operation and of the personal safety of the operators, and all shafting has been sunk into the floor, to permit of the workers being able to move about freely without any danger.

The ground material is then discharged into mixing and separating chest. From this chest the pulp for ordinary paper passes direct into two beaters for preparation ready for the machine, whereas the pulp for writing paper is carried by way of a sorting device to a bleaching and washing beater of 35 cu. meters capacity.

The bleaching and washing engine is fitted with a screw pump for turning over the pulp and also two washing drums; after completion of the bleaching process the material is discharged by means of a rotary pulp pump. The pulp is then conducted to draining vats where it is left until required.

A third beater is intended for treating rags and the pulp prepared by this machine is also conducted to draining vats by a rotary pulp pump. All beaters are provided with washing drums, and they, therefore, meet all requirements. The drive of the beaters is effected by belting from the central shafting contained in a special channel.

The pulp is ground according to the quality required for the finished product in the two beaters already mentioned and is conducted to the machine chests by means of a pulp pump. From these mixing chests fitted with agitators and buckets the pulp is conducted over a sand trap to the strainer where the last impurities are separated from the pulp.

On the paper machine, of which a reduced plan is enclosed, and the dry end of which is seen in Fig. 6, Chinese writing paper (for writing with paint brushes) of 30 gr. per sq. meter and also paper glazed on one side only for wrappings, and newsprint glazed on both sides, are being produced. The customer specified a working width of 1,950 mm. In order to attain to the desired end at the least possible expense the paper machine was designed and executed as follows:

Two cylinder moulds of 1,100 mm. diameter each, and 2,050 mm. length rotate in pulp vats constructed of reinforced concrete. The vats are arranged for the admission of pulp on the counter-current principal. The couch rolls with bearings on levers can be pressed on to the cylinders by means of weights and are provided with a quick-raising device.

The wet section contains two wet presses of modern design. One suction box, one felt-cleaning box with beater, one felt washer with rolls are provided for the taking-up felt. The extraordinary length of the felt necessitated a correspondingly long felt tension and an accurately operating felt control. Following the wet section a drying cylinder of 1,800 mm. diameter is provided which can be used as a preliminary dryer or else as receiving and glazing cylinder, as required. A pressing roll of 350 mm. diameter covered with rubber, carried in stout bearings, is pressed against the cylinder by means of springs for the last mentioned operation. For the upper felt one felt washer with rolls, together with the complete felt guiding device is fitted on cast iron rails above the wet presses.

The dryer part consists of four paper dryers of 1,250 mm. diameter and two felt dryers of 800 mm. diameter. All the dryers have a length of 2,150 mm. and the branches for steam inlet and water outlet are installed on the driving side. The steam pressure gauges are fitted on the attendant's side, so that the attendant can control or check the heating effect of the drying cylinders without leaving his stand. The felt guide rolls rotate in "Sellers" bushing with automatic adjustment, the paper guide rolls were fitted with roller bearings.

The calender comes next; it is fitted with five rolls of chilled iron of 400, 250, 280, 250 and 350 mm. diameter. The cast iron frames are of the closed type. The lifting device consists of spindles and worm gears which are actuated simultaneously on the attendant's side and on the driving-side by means of a transverse shaft and a chain wheel. These rolls in their raised condition, when the calender is not required, are spaced sufficiently apart from one another that any oxidation which would otherwise occur at their points of contact is positively avoided.

The longitudinal cutter is fitted with four pairs of knives and designed according to the "Kogel" system. A spray damper is fitted to the reeler for producing a fine spray for damping the paper again. The paper is wound up in the desired widths on three rods rotating in bracket bearings. Each rod is driven by friction gears with spring tension.

The machine operates in the following manner: The take up felt of the cylinder moulds is passed through both wet presses and carries the paper web to the drying section. On its return the take up felt is cleaned in the felt box washer and is again prepared by the felt press for renewed taking up of the pulp web. The cylinder moulds are covered with fine bamboo rods which mark the paper in such a way that it resembles the hand-made Chinese paper. Moreover, means have been provided for producing artificial water-marks by a special device fitted to the first dryer.

For producing light weight papers an upper felt is carried through the two wet presses which conducts the wet web through the receiving cylinder and it is pressed on to it by the rubber covered pressing roll. Printing paper is made without being pressed and the smooth surface is put on in the calender after the paper has passed the drying part. The paper machine is driven from an electric motor by parallel shafting. The number of revolutions of the motor is adjustable within the ratio of 1:5. The working speed of the machine can be varied between 10 and 50 meters per minute. The adjustment of the paper tension between the separate units is effected in the usual manner by shifting the belts on the wide cone pulleys. Each group can be started or stopped by means of a friction coupling; it must, however, be stated that the two wet presses as well as the first drying cylinder are driven by a friction coupling fitted to the one counter-shaft. This arrangement had to be adopted on account of the endless upperfelt passing through these three groups.

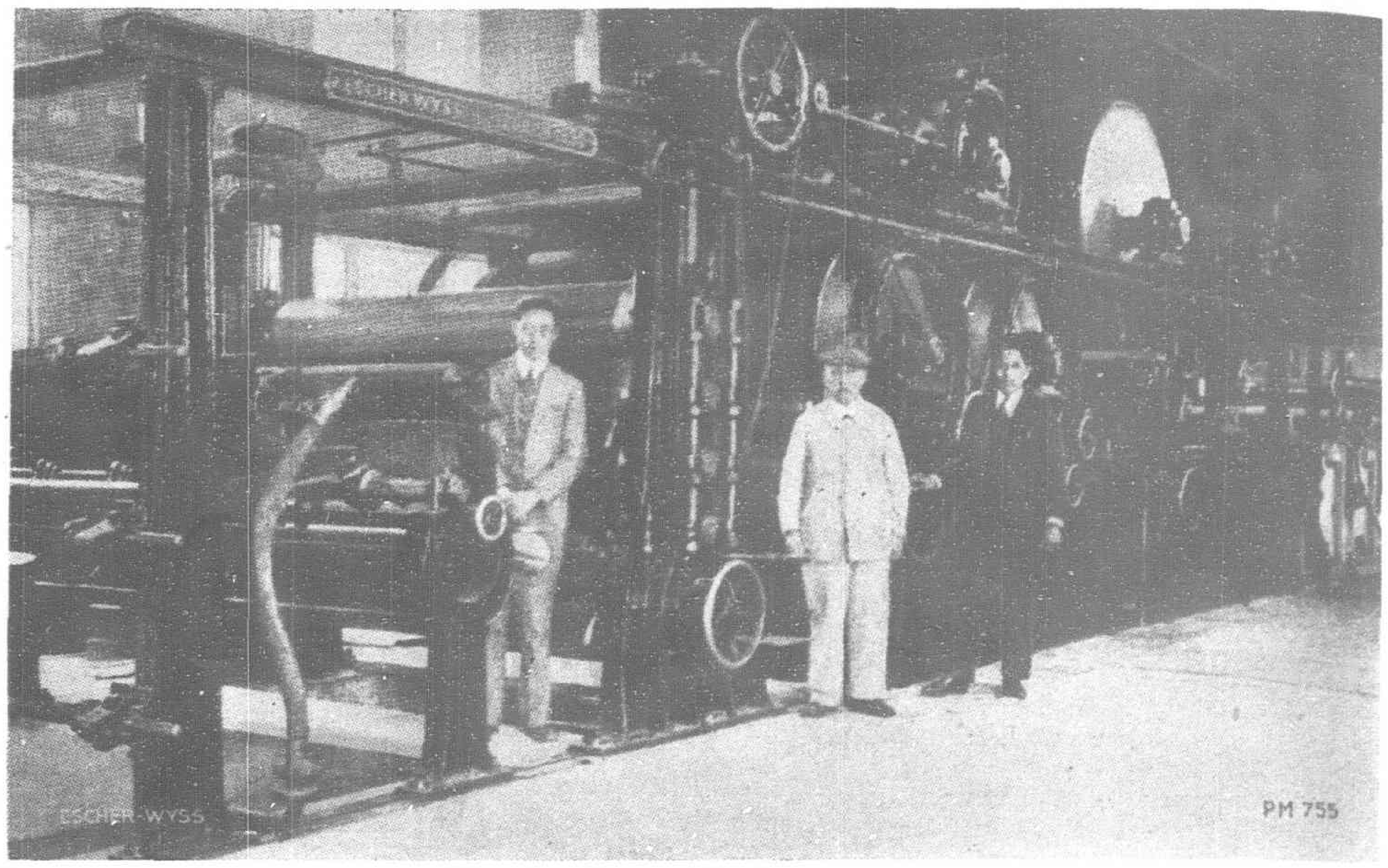

Fig. 6.—Paper Making Machine

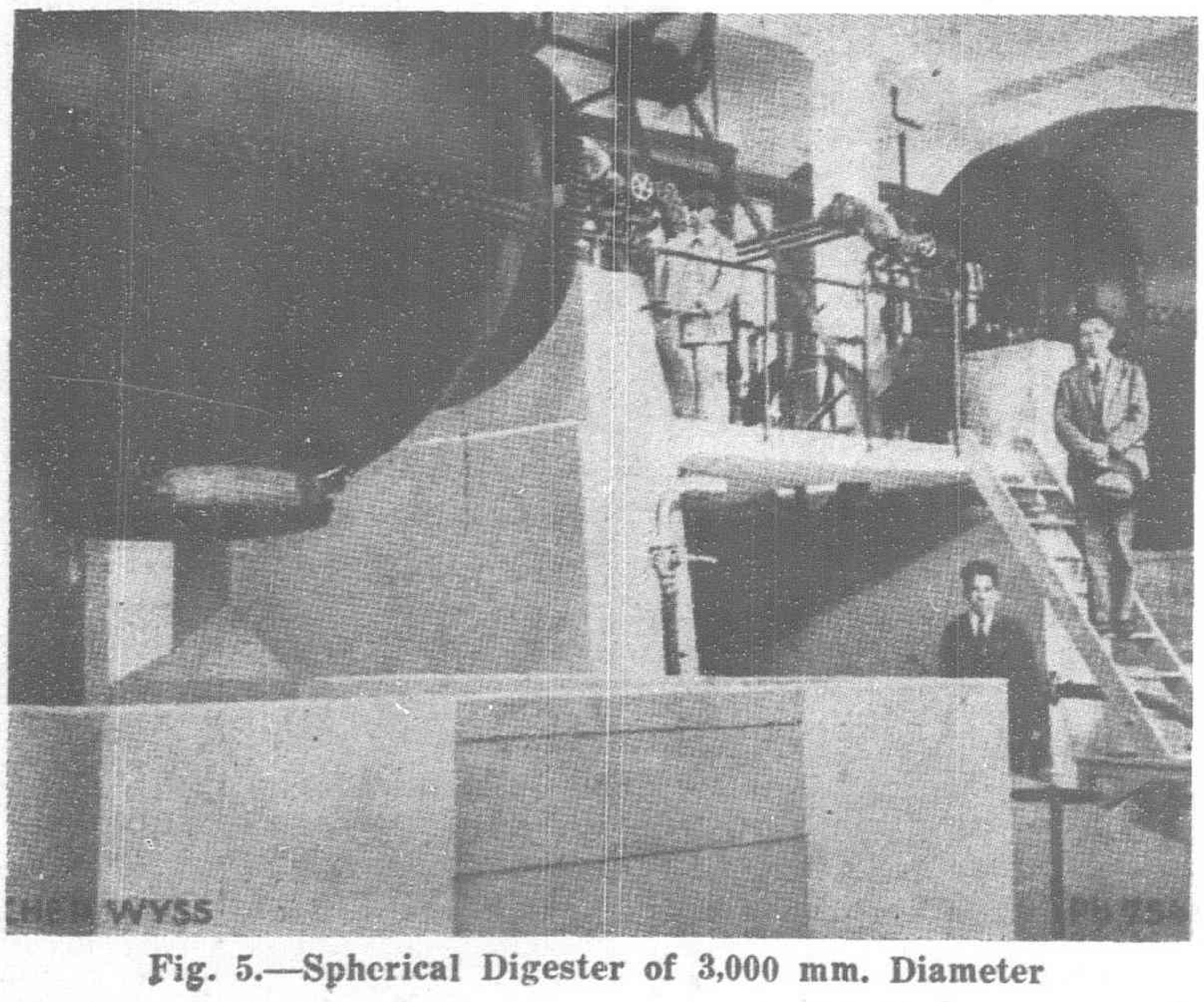

Fig. 5.—Spherical Digester of 3,000 mm. Diameter

The drive of the machine chests mentioned above, of the strainer, and also of the vacuum pump for the felt suction and of the white and waste water pump is effected by an electric motor of constant speed of 30 h.p. capacity.

At the end of the paper machine a cross cutter of approved design is fitted, by means of which the reels are cut to sheets of the required size.

For meeting the power requirements Messrs. Escher Wyss have supplied a boiler installation of one "Garbe" boiler of 130 sq. meters heating surface and pressure of 14 atm. (Fig. 7). The fire box has been adapted to the special requirements of the dust coal of Southern China.

The vertical steam engine, fitted with steam extraction device, develops an average of 400 h.p. and it drives on the one hand, by means of the main transmission shafting, all the machines employed for preparing the pulp, and on the other hand, by means of belting, a number of generators. One machine of this group will produce 195 kw. alternating current for the small electric motors mounted in different places of the works, and for the electric lighting. The second and the third machine constitute together the control section for the variable drive of the paper machine.

The steam drawn from the steam engine, of two and-a-half atm. is used for the paper drying cylinders. For heating the spherical digesters live steam is reduced to eight atm. by way of a reducing valve and it is conducted to the digesters through control valves.

The filtering plant for the factory water supply must now be mentioned. The vicinity of the river is of advantage, but the water from the river in its natural condition cannot be used owing to the large quantity of mud contained therein. It was, therefore, necessary to erect a filtering plant, consisting of a preliminary settling tank and two sand filters of five meters diameter each. It should also be mentioned that the water level of the river Min-kiang is influenced by the tides and varies three to four meters, the suction pipeline had therefore to be placed 90 meters into the river. Sufficient reserve was provided for the water pumps and therefore interruption of the work in this direction cannot occur.

The installation was erected by Escher Wyss erecting engineers and it was handed over for permanent operation six months ago. The plant has been running since then to the fullest satisfaction of the owners. The last reports received show clearly that the paper of the new mill has been well received on the native market.

A Synchronizing System for Electrical Transmission of Pictures*

By Dr. YASUJIRO NIWA, Chief Engineer, Nippon Electric Company, Tokyo

SUMMARY.—A synchronizing system for use in the electrical transmission of pictures is described. In this system a tuning fork oscillator similar to that at the sending station is provided at the receiving station, maintaining its frequency approximately equal to the frequency at the sending station. With the picture current from the sending station there is transmitted a very small synchronizing current which, acting on the tuning fork oscillator at the receiving station, brings the frequency of the tuning fork oscillator at the receiving station in exact synchronism with the frequency of the tuning fork at the sending station. A brief account of some preliminary experimental work on the relation between the power required for forced synchronization and the frequency difference is given.

Sample pictures received by a system employing this method of synchronization between Tokyo and Osaka by short wave radio are also shown.

THERE are two kinds of synchronizing methods for electrical transmission of pictures, excluding the so-called start-stop method. In one, synchronizing current is generated at the sending end to drive the synchronous motor there and at the same time, either by wire or radio, a part of the current thus generated is transmitted to the receiving end, where the current received is amplified and used to drive another synchronous motor thereby maintaining the synchronism of the system. In the other, a source of alternating current is provided separately for the sending and receiving stations, respectively, and synchronous operation is attained by carefully regulating the frequency of the alternating current.

Comparing the two methods of synchronous operation, the writer is of the opinion that, at any rate when transmitting by wire, the use of synchronizing current has decided advantages, one of which is that if the apparatus is run synchronously by a synchronizing current, care need be taken only of the operation of the synchronous motors at the sending and receiving stations and as a consequence, the operation at both stations is greatly simplified. In the writer's system† of electrical transmission of pictures (Nippon Electric System), therefore, this method has been adopted for open wire and cable lines and has proved its superiority by the successful operation of the system during the past three years between Tokyo and Osaka by the *Daily News* and the Department of Communications, both of which adopted the N.E. System from the inauguration of the picture transmission service in October, 1928, and August, 1930, respectively.‡

When the communication channel joining the sending and receiving ends is unstable, it is not easy to transmit the synchronizing current without difficulty; therefore, in order to insure accurate synchronism in such a case, a system in which separate alternating current sources are installed at the sending and receiving ends for driving the respective synchronous motors is considered more suitable.

When the synchronous motors are thus driven by separate sources, the difference in frequencies of the sources requires serious consideration, since an undue frequency difference will cause a slip in the picture received and make it distorted. The extent to which the frequencies should coincide can be determined as follows:

Denote the length and width of the picture by "a" and "b," and the line density by "d" and the permissible slip of the picture by "8." Then the coincidence of the frequencies of synchronizing currents at the sending and the receiving ends should be within the value $\frac{8}{a x b x d}$. When a picture of size 18 by 26 cm. is transmitted using the line density of 50 lines per centimeter with an allowable slip of 2 mm., the difference of frequencies at both ends should not exceed one in 117,000.

The maintenance of such a degree of accuracy is accomplished by the use of a tuning fork which is kept at a constant temperature. Thus each fork is kept in a constant-temperature tank and the

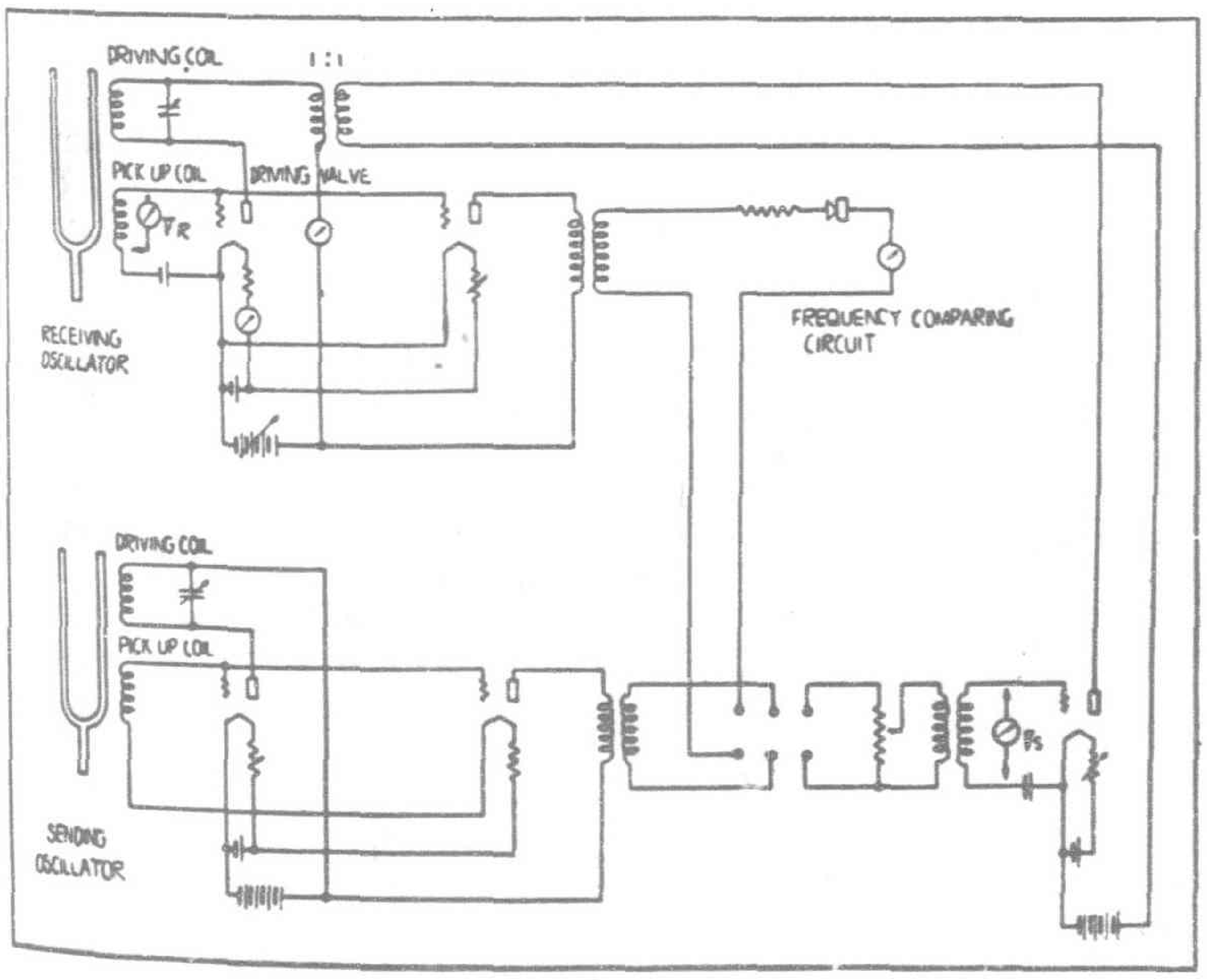

Figure 1

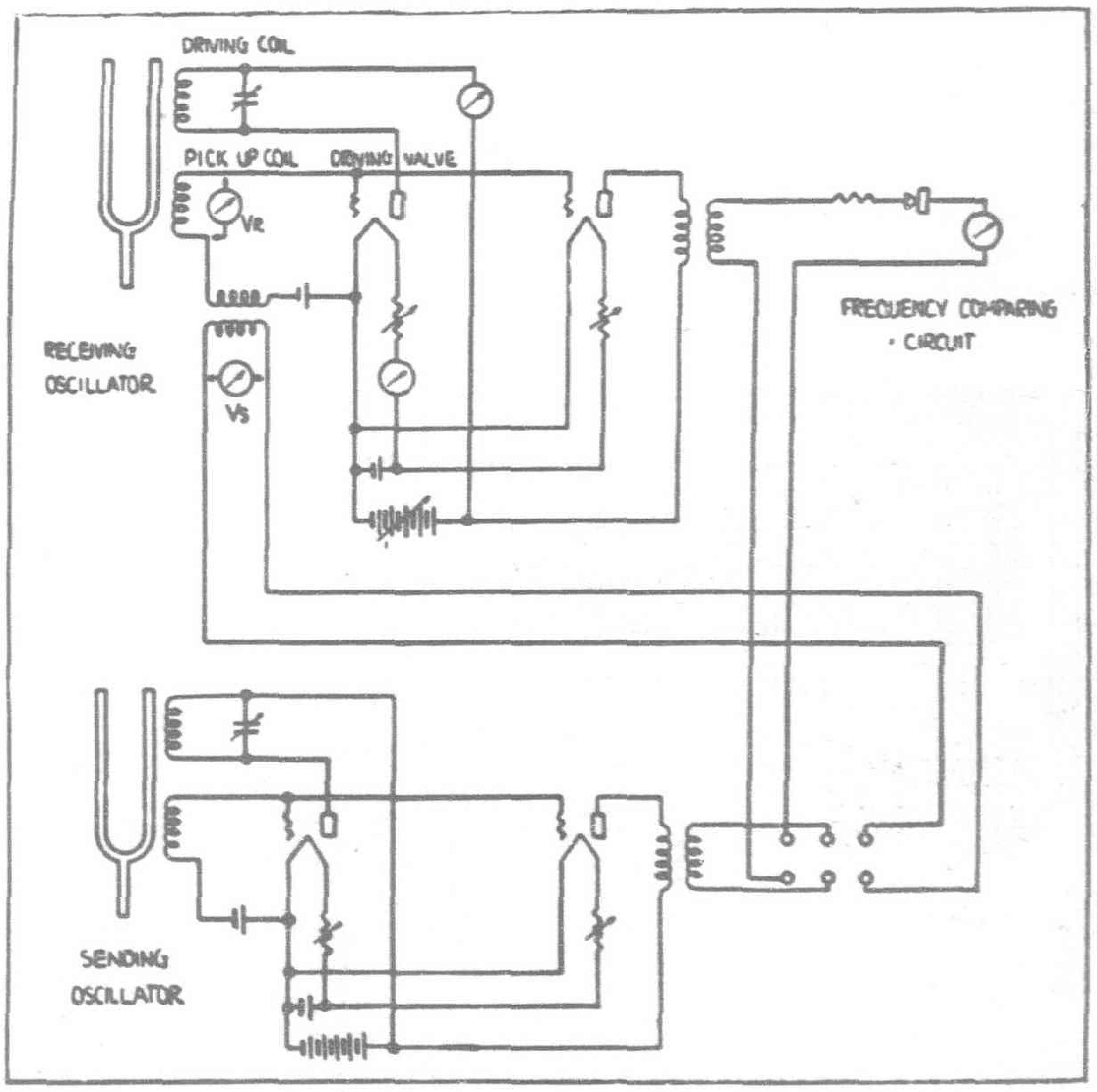

Figure 2

Paper presented before the International Electrical Congress, Paris, July, 1932 as published in "Electrical Communication"

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* Paper presented before the International Electrical Congress, Paris, July, 1932, as published in *Electrical Communication*.

†Y. Niwa, "A System of Electrical Transmission of Pictures," *Electrical Communication*, April, 1930.

‡ S. Inada, "Public Service of Phototelegraphy in Japan," *Electrical Communication*, July, 1931.

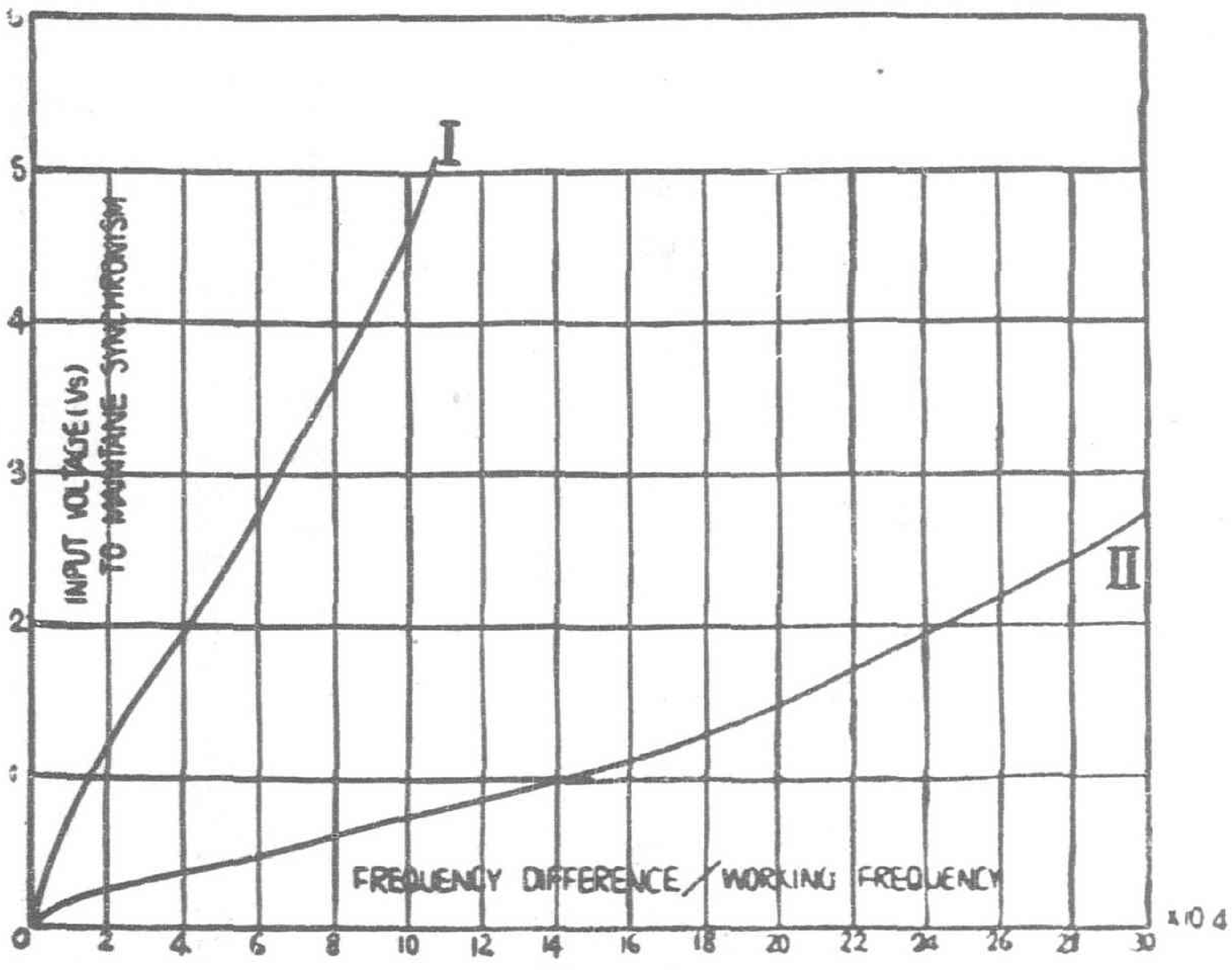


Figure 3

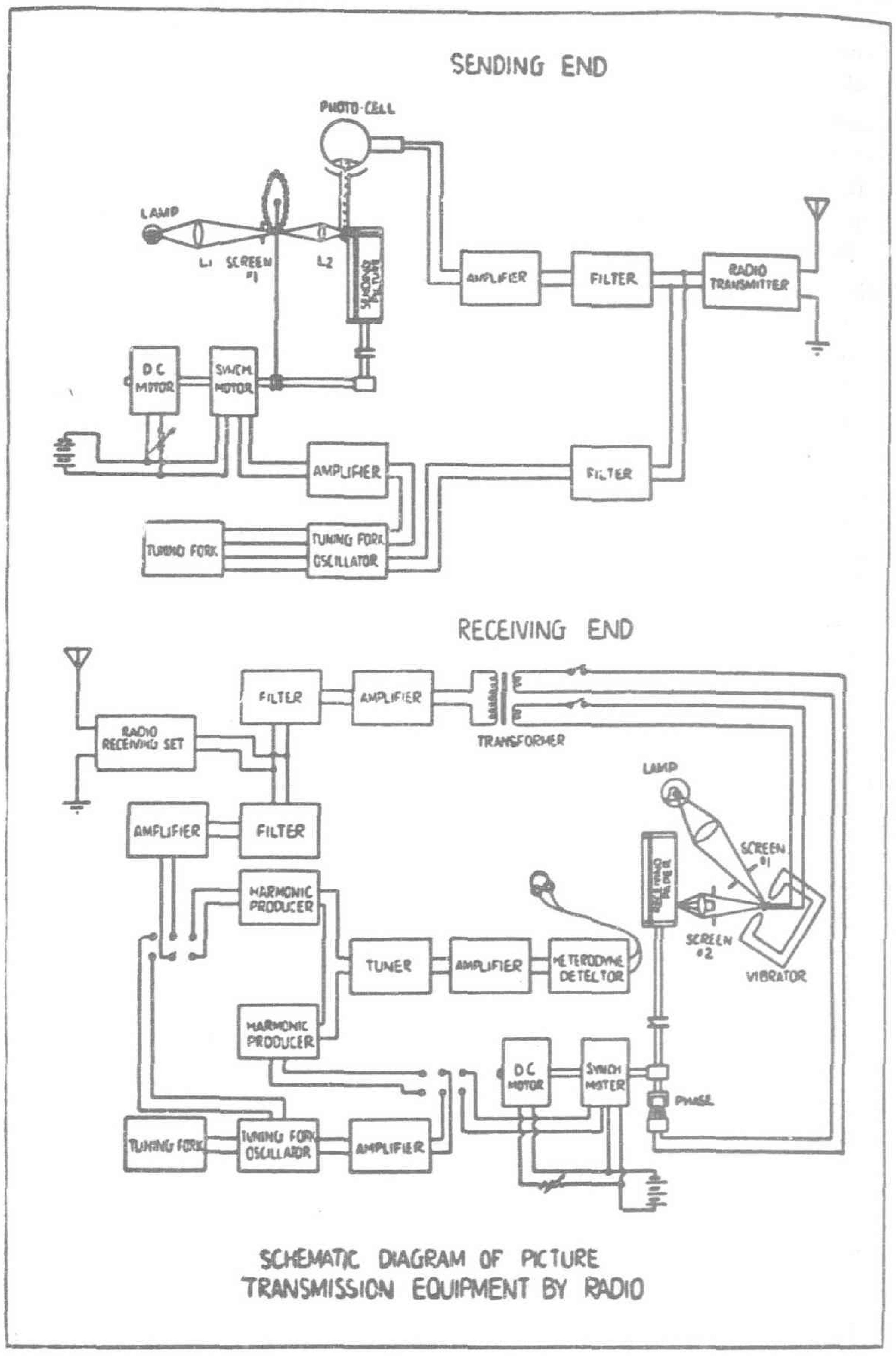


Figure 4—Sending End

Figure 5—Receiving End

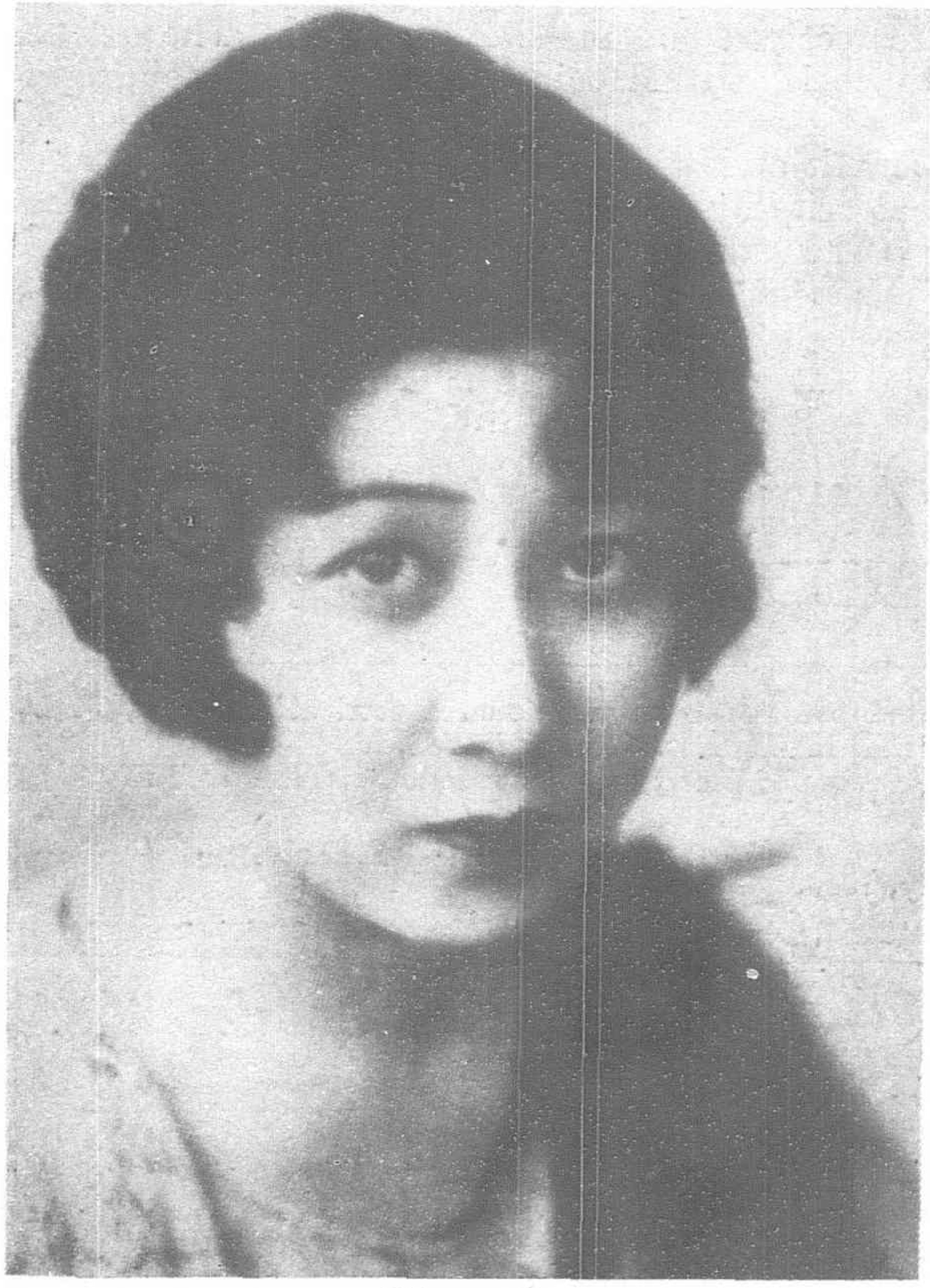


Figure 7

electrical source for driving the fork is carefully maintained at a constant value. Since the characteristic of a tuning fork oscillator is such that it requires considerable time (from one to several hours) before its frequency reaches a constant value, it is necessary that the fork should be kept oscillating constantly. Consequently, some troubles (such as the temperature of the constant-temperature tank falling, due to poor connection of its heating source, faulty operation of the thermostat regulator, or changes in the power source of the oscillating vacuum tube) will make the transmission of a picture impossible until a constant condition is restored. Thus, if synchronous operation is to be attained by using a separate generator for the sending and receiving stations, respectively, it not only necessitates the use of complex apparatus or mechanisms in order to keep the generators to the required accuracy, but it also requires no small effort to maintain the apparatus properly and to check the two frequencies.

In order to remove this inconvenience, the author, in collaboration with Mr. M. Kobayashi, has devised the hereinafter described synchronizing system which may be termed a forced synchronizing system and which has been used with very good results.

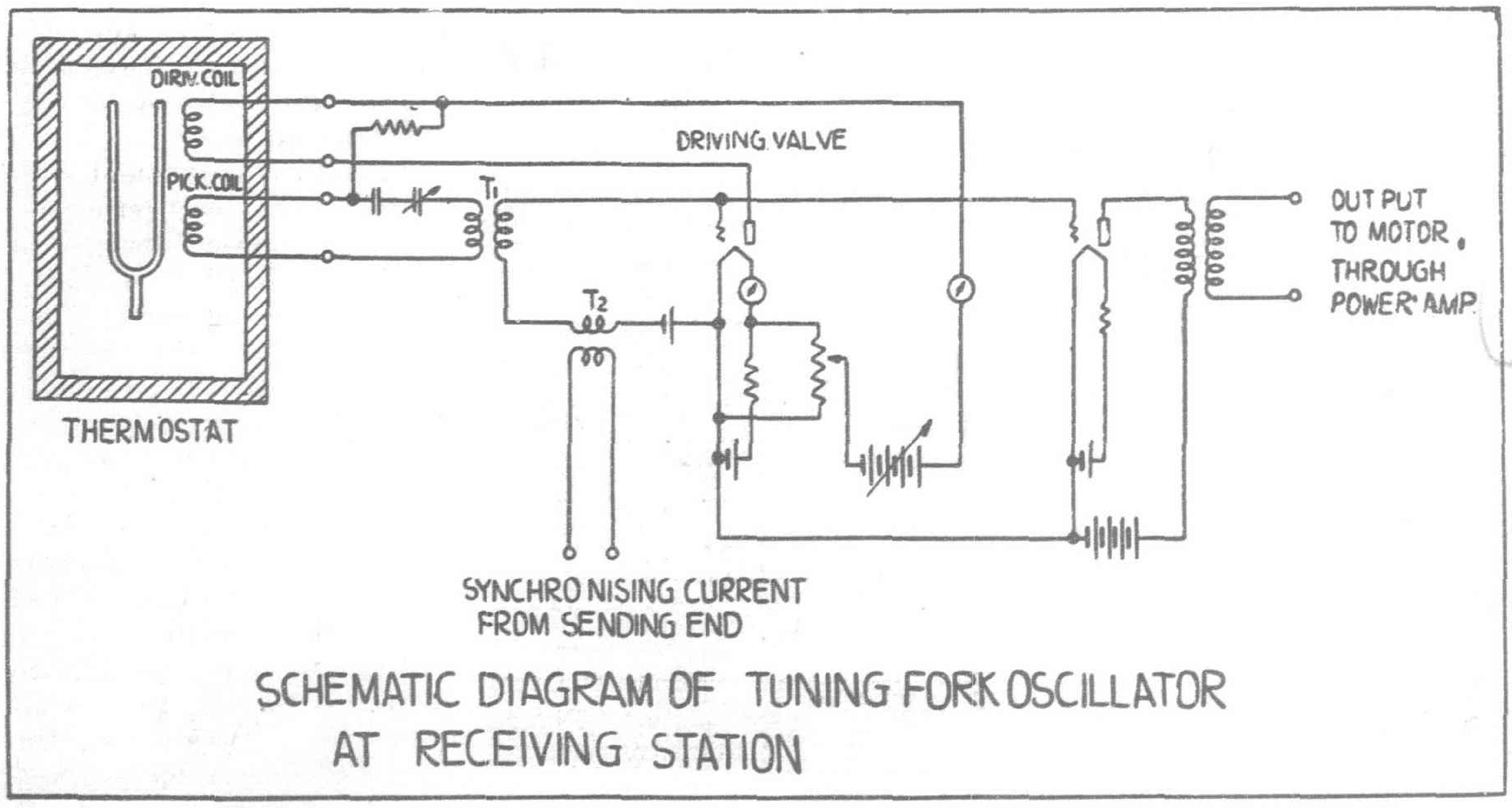
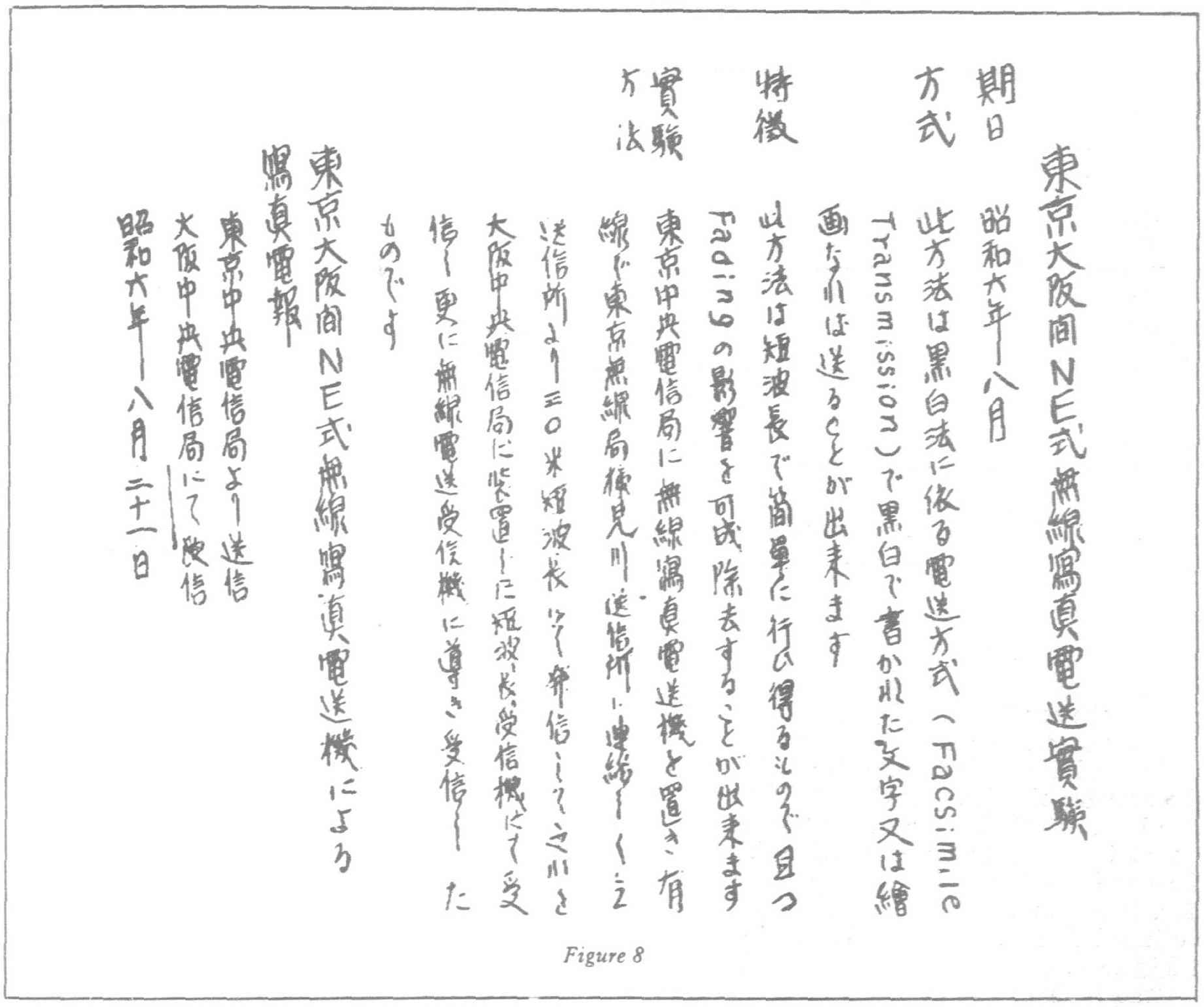

DRIV. COIL
PICK. COIL
THERMOSTAT
DRIVING VALVE
T1
T2
OUT PUT TO MOTOR, THROUGH POWER AMP.
SYNCHRONISING CURRENT FROM SENDING END
SCHEMATIC DIAGRAM OF TUNING FORK OSCILLATOR AT RECEIVING STATION

Figure 6

Forced Synchronizing System

This system may be regarded as a combination of a system which transmits the synchronizing current and one which does not transmit it. In this system, a very small synchronizing current is transmitted with the picture current from the sending station. At the receiving station a tuning fork oscillator is provided which is similar to that at the sending station and its frequency is maintained approximately equal to the frequency at the sending station. The synchronizing current received at the receiving station is suitably amplified and then supplied to a part of the oscillating circuit of the tuning fork oscillator at this station. The result is that the tuning fork oscillator at the receiving station is brought under the control of the current received due to the so-called pulling effect of the current on the tuning fork oscillator, and its frequency is brought in to exact synchronism with the frequency of the current received, that is, with the frequency of the tuning fork oscillator at the sending station.

Connection for leading the current received to the tuning fork oscillator may be established by inserting a transformer in series in the grid or plate circuit of the vacuum tube which is driving the tuning fork oscillator. Though the smaller the frequency difference, the more satisfactory will be the result, the maximum frequency difference for which the pulling effect of the current received may be utilizable is approximately one in 1,000. The system is applicable to either the wire or radio operation, but if it is used in connection with radio, a greater benefit will be obtained. In the latter, the current received decreases occasionally due to fading ; at such times the tuning fork at the receiving station is not under the control of the current transmitted, but since it will be restored under the normal control as soon as the current has again increased, synchronism satisfactory as a whole will be maintained.



東京大阪間NE式無線寫眞電送實驗

期日　昭和六年一八月

方式　此方法は黒白法に依る電送方式（Facsimile Transmission）で黒白で書かれた文字又は繪画なりは送ることが出来ます

特徴　此方法は短波長で簡單に行ひ得るもので且つFadingの影響を可成除去することが出来ます

實驗方法　東京中央電信局に無線寫眞電送機を置き有線に東京無線局検見川送信所に連絡し之送信所より三〇米短波長にて発信して之れを大阪中央電信局に装置した短波長受信機にて受信し更に無線電送受信機に導き受信したものです

東京大阪間NE式無線寫眞電送機による
寫眞電報
東京中央電信局より送信
大阪中央電信局にて受信
昭和六年一八月二十一日

Figure 8

Figure 8

Power Required for Forced Synchronization

Supposing the frequency of the tuning fork oscillator at the receiving station is pulled into synchronism by the power from the tuning fork oscillator at the sending station, an experiment was first made to determine the relation between the power required for forced synchronization and the difference of frequencies of the two tuning fork oscillators.

In this experiment two methods were used for coupling the power from the sending tuning fork oscillator to the receiving tuning fork oscillator, i.e., (1) through the plate circuit and (2) through the grid circuit, as shown in Figures 1 and 2, respectively. The difference of the frequencies of the two sources was kept constant and the input voltage applied to the grid or plate circuit of the vacuum tube driving the controlled tuning fork oscillator was decreased until the controlled oscillator stepped out of synchronism, which

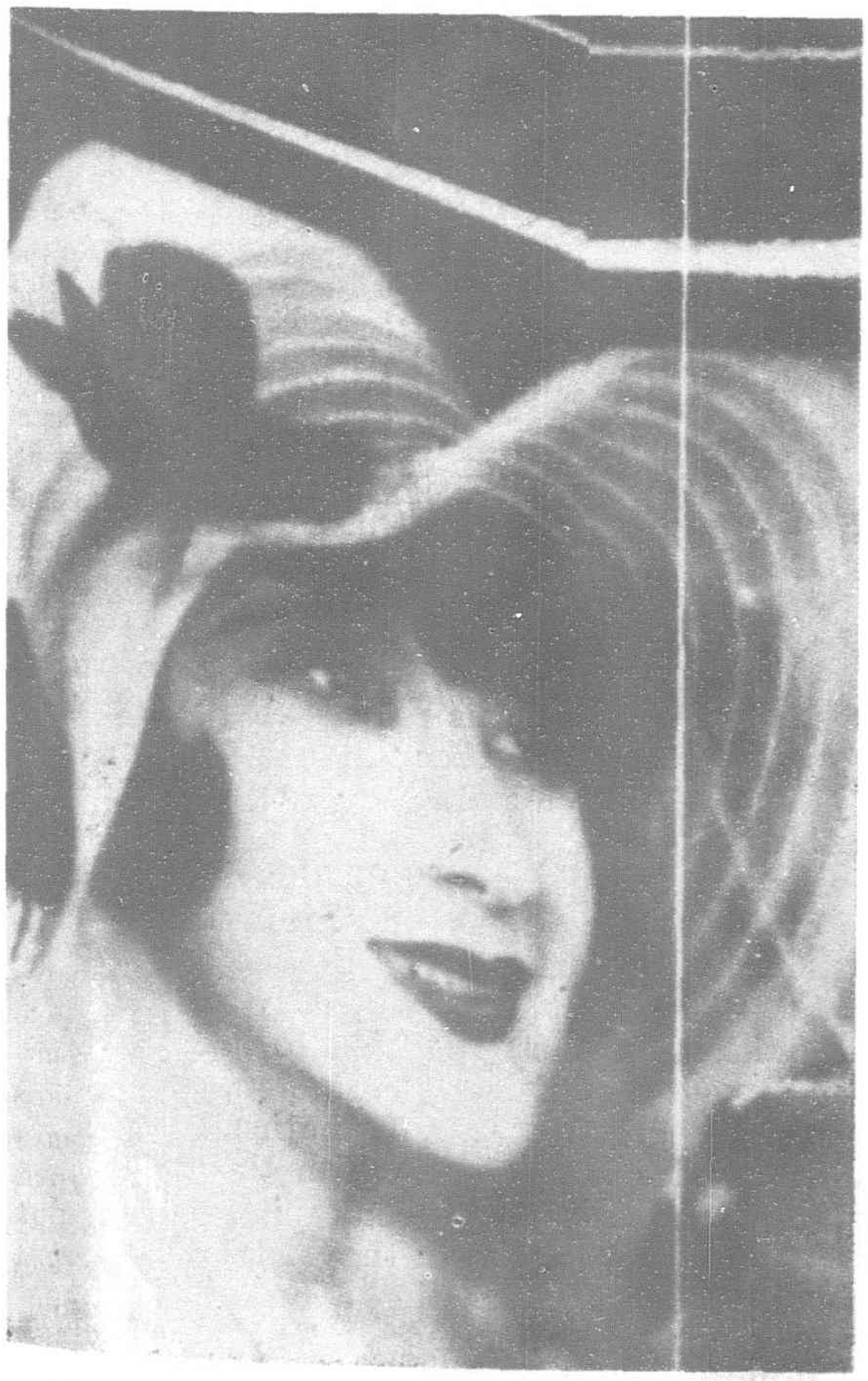


Figure 9

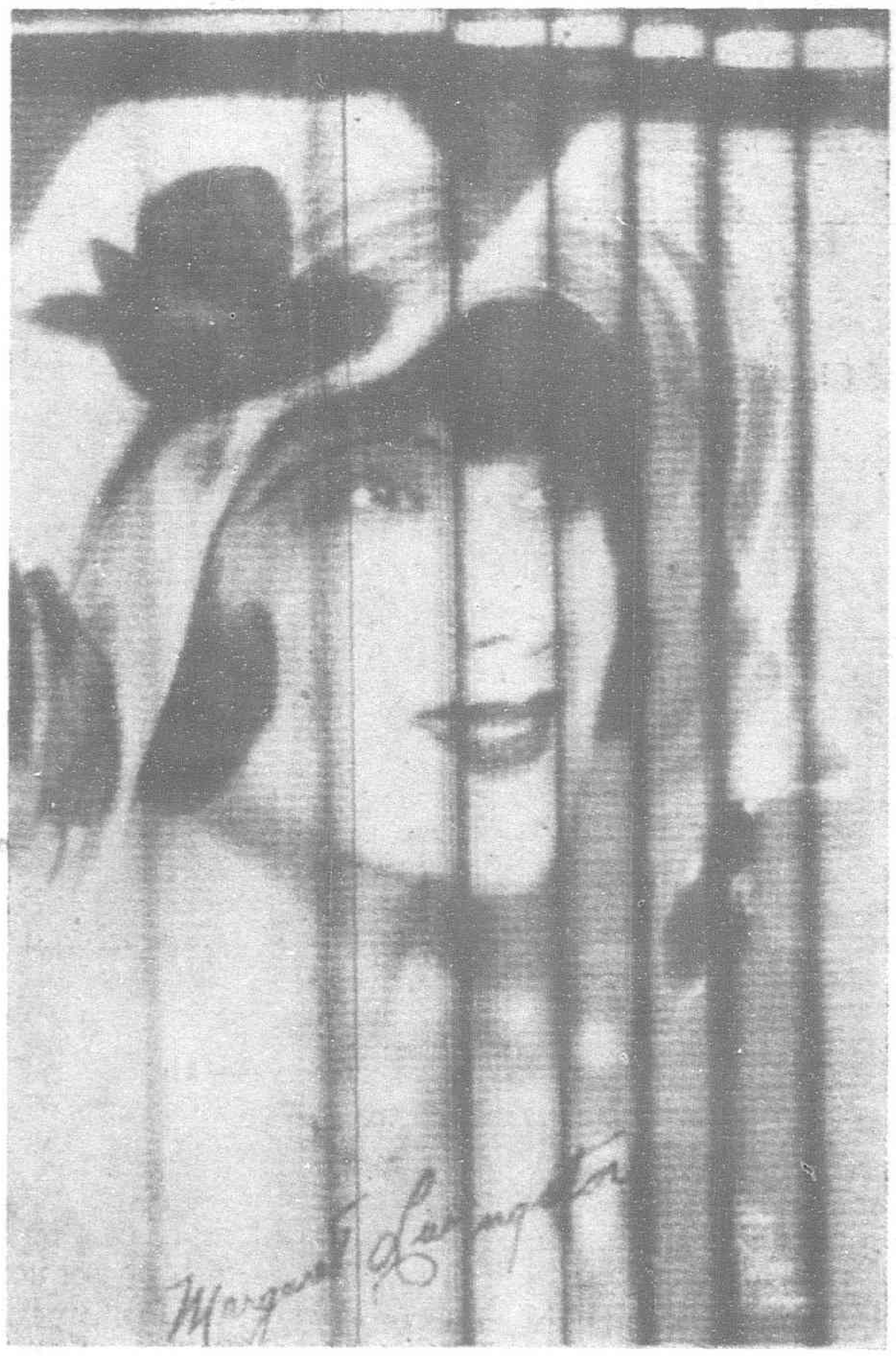


Figure 10

could be detected by the beating of the meter of the frequency comparing circuit. Figure 3 shows the results of the experiments, curve I for case (1) and curve II for case (2). The abscissa indicates the frequency difference and the ordinate, the input voltage to the plate or grid of the tuning fork maintained oscillator, i.e., the reading of the voltmeter V_S in Figures 1 and 2 below which synchronization ceases. In case (1) the output voltage of the pick-up coil V_R was about 10-volts, and the necessary synchronizing power was roughly 5 per cent of the controlled power per 10^{-4} difference in frequency. In case (2) the output voltage of the pick-up coil of the tuning fork was about 10 and the synchronizing power was about 0.7 per cent per 10^{-4} difference in frequency.

It was shown experimentally that these relations hold good for a frequency difference up to 20 by 10^{-4} while stable synchronization becomes impossible above 30 by 10^{-4}.

Schematic Diagrams of the System

Figures 4 and 5 are schematic diagrams of the writer's picture transmission system with this synchronizing method applied. Figure 4 shows the sending end and Figure 5 the receiving end. Full explanation of the system has been given in previous papers* except for the synchronizing method which will only be mentioned below.

At the sending station a synchronizing current of 300-cycles superposed on the picture current is fed into the speech input amplifier of the radio transmitter just as in the system for open wire or cable circuits. At the receiving station, after the currents have been detected, they are separated by filters and the picture current is passed to the translator through the high pass filter. The synchronizing current, after passing through the low pass filter, is fed to the tuning fork driving oscillator. The coupling is effected through the grid circuit of the driving tube, as shown in Figure 6.

The tuning forks at the sending and receiving ends are kept in the constant temperature chambers with thermostat regulator. But the constancy of the two frequencies need not be kept so accurately coincident as is required for independent synchronization, which means easier maintenance, less trouble, and more convenience in the operation.

For checking the coincidence of the frequencies of the tuning fork oscillators at the sending and the receiving ends, the synchronizing current only is sent from the sending station and it, after being received, is mixed with the synchronizing current at the receiving end. The degree of coincidence can be judged from the period of beat of the two frequencies. However, direct beats of the two frequencies will be too slow to enable quick adjustment; for example, if the difference of the frequencies be one in 20,000, with a fundamental wave of 300-cycles, the period of beat will be about one minute. In order to remove this inconvenience, the 30th harmonics of the fundamental frequencies are picked up, by using a special harmonic producer with a neon lamp and allowing them to beat so that a comparison of the frequencies can be made. In this way the period will be reduced to a few seconds. In Figure 5, the arrangements for checking the frequencies are shown.

Results of Actual Operation

The new system has been given field trials with successful results between Tokyo and Osaka, about 450 kilometers apart, by short wave radio. Figures 7 and 8 show some of the transmissions obtained with a 7,890 kilocycle wave. The original picture was cabinet size (13 by 18 cm.) and the time of transmission was about five minutes with a line density of five per mm.

It was found that the tuning fork at the receiving stations is pulled into synchronism if the difference of the two frequencies is within 10 by 10^{-4}, provided the synchronizing power to the grid of the driving oscillator of the tuning fork at the receiving end is about the same as the induced voltage from the same fork, i.e., the synchronizing current is about one-fourth of the picture current. If the difference of frequency is below 6 by 10^{-4} the stepping in or out of the tuning fork oscillators is effected very smoothly while, above this limit, hunting of the synchronous motor is caused as a result of pulling in or out.

An example of a picture, Figure 9, will explain the effect of this forced synchronization. The right portion of the reproduction was made with the forced synchronizing system and the left, with independent synchronization. It is to be seen that during the period of independent synchronization, the picture is slipped due to the frequency difference which is one in 1,000 while as soon as forced synchronization is introduced the coincidence of the frequencies can be seen from the accurate framing of the received picture. Figure 10 shows another example of pictures received over a radio circuit suffering from severe fading. Black lines on the picture show the period during which the signals, picture as well as synchronizing, faded out. It may be seen that as soon as the signal intensity recovered, exact synchronism was again established notwithstanding the fact that the difference of the two frequencies were kept exceptionally large for experimental purpose, i.e., one in 300.

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* Loc. cit.

Resources of Chinese Turkestan

The oil and mineral riches of Chinese Turkestan are described in *The English Review* by P. S. Nazdroff, a noted Russian geologist, whose article has been translated by Dr. Malcolm Burr.

The oil is worked to the west of Kashgar at a place called Kusheiku, near the city of Ak Su, and at Kucha. It is simply distilled for lamp oil and burns excellently in the native chiraks without any purification. Like the oil of Russian Turkestan, it has a high content of paraffin wax. At Kashgar, near Ming Yul, the oil contains a considerable proportion of benzine. At Kucha it is of a light yellow color, precipitating on freezing an almost pure white paraffin wax. There can be no doubt that these deposits of oil will one day play a very important part in the life of Siberia and the Far East.

Chinese Turkestan is also rich in good coking coal. Seams occur in limestones of carboniferous age, also along the northern side of the province. It is mined to the west of Yangi Hissar, and an excellent bed of coal occurs in the neighborhood of the copper ore of Kanjigan, of which the Chinese make coke by primitive methods. The whole of the district is rich in useful minerals.

The goldfields of Chinese Turkestan are situated in the center of the Kuen Lung from the meridian of Lob Nor to Karangu-Tagh, and also extend farther to the west. Here, over an extent of 460 miles on the foot-hills and in the ravines at altitudes ranging from 7,500 to 15,000 feet above the sea, there are 12 groups of placers—that is to say, alluvial gold—occurring in beds of gravel and conglomerate. Then, by secondary remaniement of these old gravels by torrents, further deposits occur in recent alluvium.

In spite of the great age of the gold-working industry in this country, the native workings have scratched only an insignificant portion, either in depth or area, for they go down hardly deeper than four or five feet on account of their primitive methods, lack of tools, especially of picks and crowbars, to say nothing of pumps and windlasses. From year to year the natives continue to work in the same spots, without touching other virgin deposits of equal facility and richness, even alongside their own workings.

The author adds that the exploitation upon an industrial scale of the immense goldfields of Southern Kashgaria would have fewer obstacles to overcome than many of the Siberian fields, to say nothing of Klondyke and the Australian deserts.

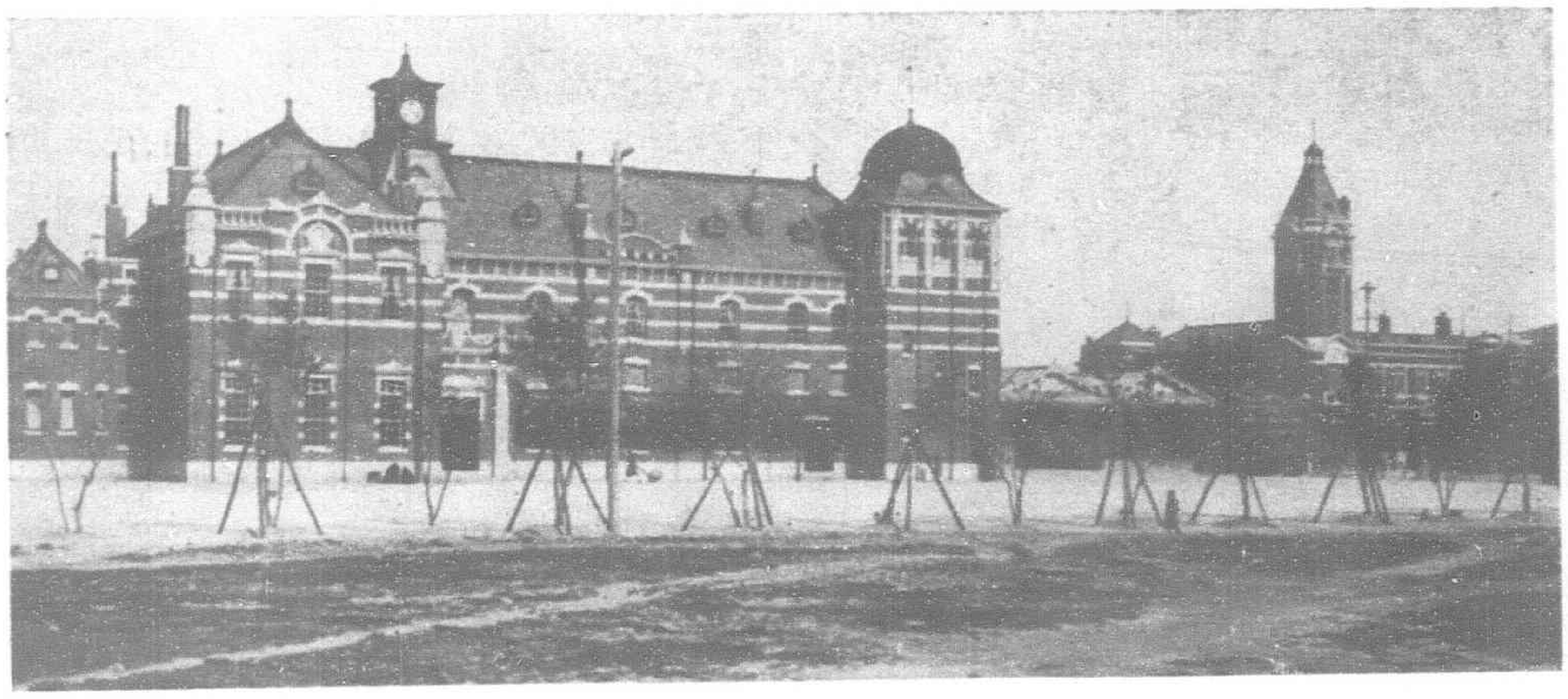
It is evident that the Soviet Government is surreptitiously taking advantage of the helplessness of China to take possession of the apparently desert land of Eastern Turkestan, about which the Powers have only the most meagre information, without any conception of the world-wide importance which the country will have one of these days when open to European capital and methods. There can be no doubt about the policy of the Soviet Government, and consequently of the Third International, once in possession of this immense wealth, with a foot firmly planted on the frontiers of China, Tibet and India.—*Birmingham Mail.*

Communications in Chosen[*]

The first instance of a railway in Chosen was the Keijo-Jinsen line opened in 1900, and this was followed in 1904 by the opening of the main line between Keijo and Fusan. These were undertakings by private companies. In 1905 the Keijo-Shingishu main line and the Masan branch line, both built for army use during the Russo-Japanese War, were opened to the public, and with the former the trunk line from north to south was made complete. In 1906 the Japanese Government took over all existing lines and placed them under the Railway Bureau of the protectorate, but on the Government-General being established in 1910 control of them once more changed hands. During all this time improvement and construction work was steadily carried on, and the year 1910 saw the completion of the Heijo-Chinnampo line; in 1911 the Yalu was spanned by an iron bridge to connect the Korean and Manchurian railways; in 1914 the Taiden-Mokpo line in the south and the Keijo-Gensan line in the center were completed; in 1914 the Gensan-Kainei line in the north measuring 383 miles was started and completed in September, 1928, at the cost of Y.90 million.

Iron Bridge over the Kan River

In the meantime, single control of the railways in Chosen and Manchuria being considered advisable from the commercial point of view, the Government-General in 1917 concluded a contract with the South Manchurian Railway Company and entrusted to it the entire management of the Korean State railways. This continued down to March, 1924, when the Government - General again took into its own hands the operation of the State lines in this country.



The Railway Station at Fusan

In 1927 the Government-General proposed a twelve year plan during which to construct a "Tumen River" line and other four lines totaling 1,384 kilometers and to buy out and improve the Zenshu-Riri Railway and other four lines totaling 339 kilometers. At present the foregoing plan is being carried on effectively and when it is completed it is hoped that the railway traffic of Chosen will enter a new epoch-making period. At the end of March 1932 the total investment in government railways reached over Y. 406 million covering a length of 3,008 kilometers in active operation with 420 stations and employing 16,178 men in all, inclusive of 6,986 Koreans and four foreigners. For the purpose of training railway employees, a railway school was established in 1919 under the control of the Railway Bureau. Up to March, 1932, this school turned out 1,669 graduates including 350 Koreans. The railways in Chosen, by bridging the Yalu which forms part of the boundary and making connection thereby with the continental railways, became at once part of the international railway system, and this resulted in through traffic being established between Tokyo and Europe. The following table gives some idea of railway development in this land.

Fiscal Year	*Length (Kilo)*	*Passengers*	*Freight (Ton)*	*Receipts (Yen)*
1931[†] ..	3,008	19,670,000	6,025,000	36,300,000
1930[†] ..	2,792	20,650,000	5,936,000	36,821,000
	(Mile)			
1925 ..	1,309	18,241,000	4,297,000	30,708,000
1920 ..	1,157	12,421,000	3,186,000	28,816,000
1911 ..	674	2,024,000	888,000	4,095,000

The hotel business as an adjunct to the railway business is run chiefly for the accommodation

Bridge over the Yalu River

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[*] Annual Report on Administration of Chosen.

[†] Metric system.

of the foreign tourists. If was first started in 1912 at Fusan and Shingishu, the two principal terminals, by making use of the upper storeys of each station. In 1914 the Chosen Hotel was built on a grand scale in Keijo with two branches at Kongo-san for the convenience of mountain sightseers, and in 1922 a similar hotel was opened in Heijo.

Of the six lines now under construction the most important is the new line between Heijo and Gensan across the middle of the country, 213 kilometers in length. This was started in 1926 as a ten year enterprise, and, up to the end of March, 1931, 96 kilometers had been opened to traffic, and it is hoped it will prove another important link in the chain of traffic between North China and West Japan.

Nandaimon Street, Keijo

Private Railways

For the encouragement of private railway enterprises in Chosen, regulations were enacted in 1912 making provision for their proper supervision and protection, and in 1914 further provision was made for granting special subsidies to important lines to meet any deficiency in profit below a certain percentage on the paid-up capital of those companies to be so favored. In 1921 new regulations providing increased State aid for private undertakings were approved by the Diet and put into force for the furtherance of their development. Thus private railways in Chosen have made considerable progress, though their business condition is not yet prosperous enough to permit of them paying dividends from their earnings without drawing on the Government, and the total length open to business up to March 1932 reached 1,132 kilometers operated by seven companies, while new lines under construction, actual or projected, embraced some 337 kilometers. During the fiscal year 1931 the number of passengers carried on private railways reached 2,934,000, freight 961,000 tons, and receipts Y.3,283,394.

Tramways

There are 82 kilometers of tramways under operation in Chosen of which the major ones are as follows:

The Keijo Electric Company Tramways in Keijo	35 kilos
The Chosen Gas Electric Company Tramways in Fusan	19 „
The Heijo Municipal Tramways in Heijo	13 „
Others	15 „
Total	82 kilos

From April 1931 to March 1932, these tramways carried 49,407,382 passengers and 12,741 tons of freight and receipts amounted to Y.2,416,596.

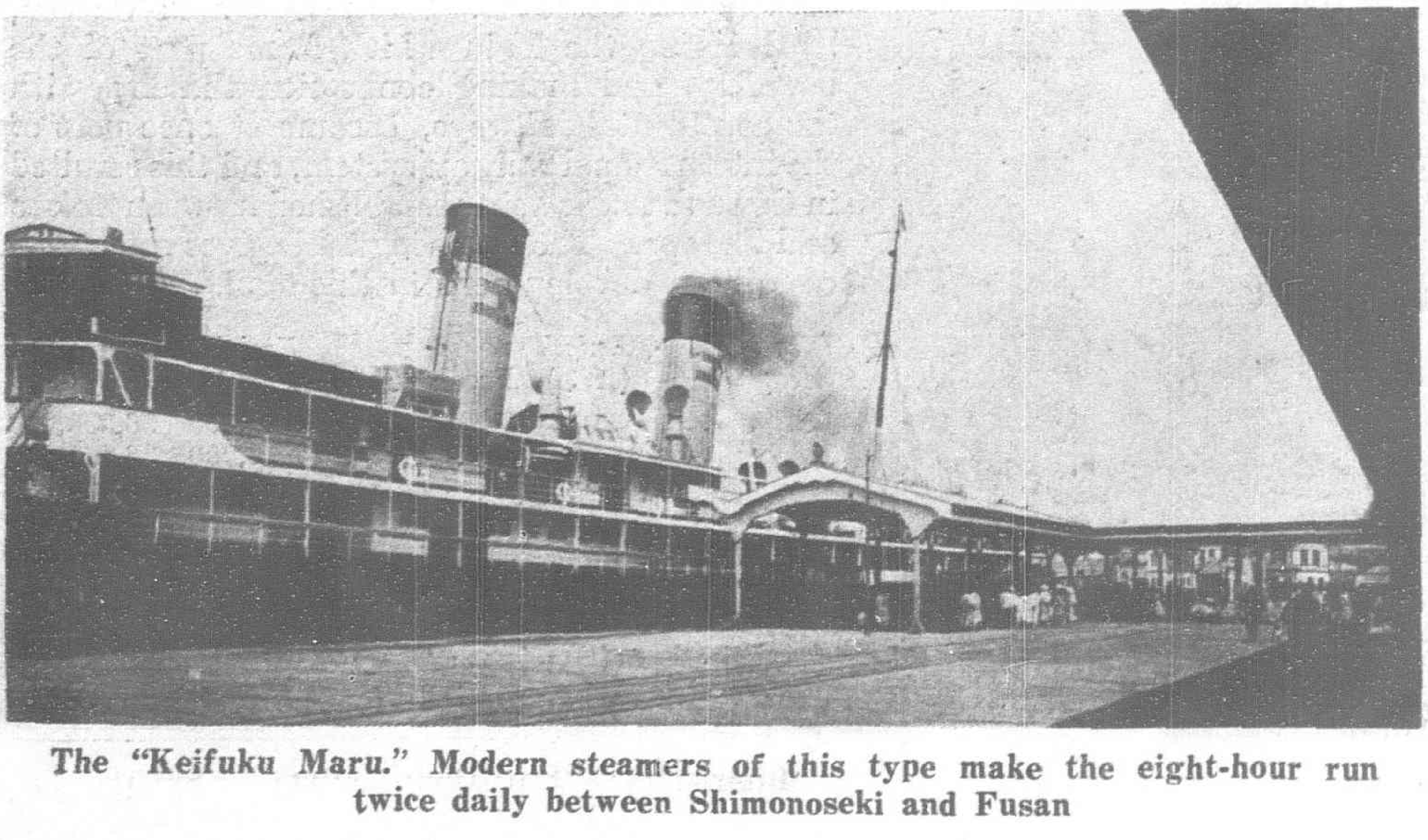
Navigation

In the year 1912 matters relating to routes, ships, seamen, beacons, etc., were all systematized and placed under the Communications Bureau of the present Government, and during 1914-15 not only were the marine regulations unified and adjusted but a marine court was created. Before the annexation there existed a few small shipping concerns under government protection, and they were induced to amalgamate into one big company, the result of which was that the Chosen Mail Steamship Company came into being in 1912 and was ordered to establish regular coasting services. There are now seven shipping companies in Korean waters.

In 1910, ships of all kinds entered in the shipping register numbered only 88 with a tonnage of 9,300, but the regulations of marine affairs under the present regime led to great progress being made in maritime traffic, and especially during the Great War the shipping business in Chosen enjoyed an extraordinary boom. At present the number of lines regularly operated is 19 with 196 vessels (steam ships) aggregating 53,998 tons, their routes being interport, Korea-Japan and Korea-China-Russia.

	Steamers		Sailing Boats	
Year	*Number*	*Tonnage*	*Number*	*Tonnage*
1919	87	35,682	483	16,432
1925	147	44,520	627	21,075
1929	185	47,161	694	23,083
1930	196	53,998	692	22,911
1931	203	52,258	750	25,138

In 1903 four lighthouses were built, and by the year 1906 the number had increased to 53, but as this merely represented one signal for every 160 nautical miles, and navigation around the archipelago on the south-western coast was particularly dangerous during the foggy season, further great increase has since been made. The total number of navigation aids now stands at 269 comprising 134 night, 112 day, and 23 fog signals, in the proportion of one night signal to every 129 kilometers of the entire coast.

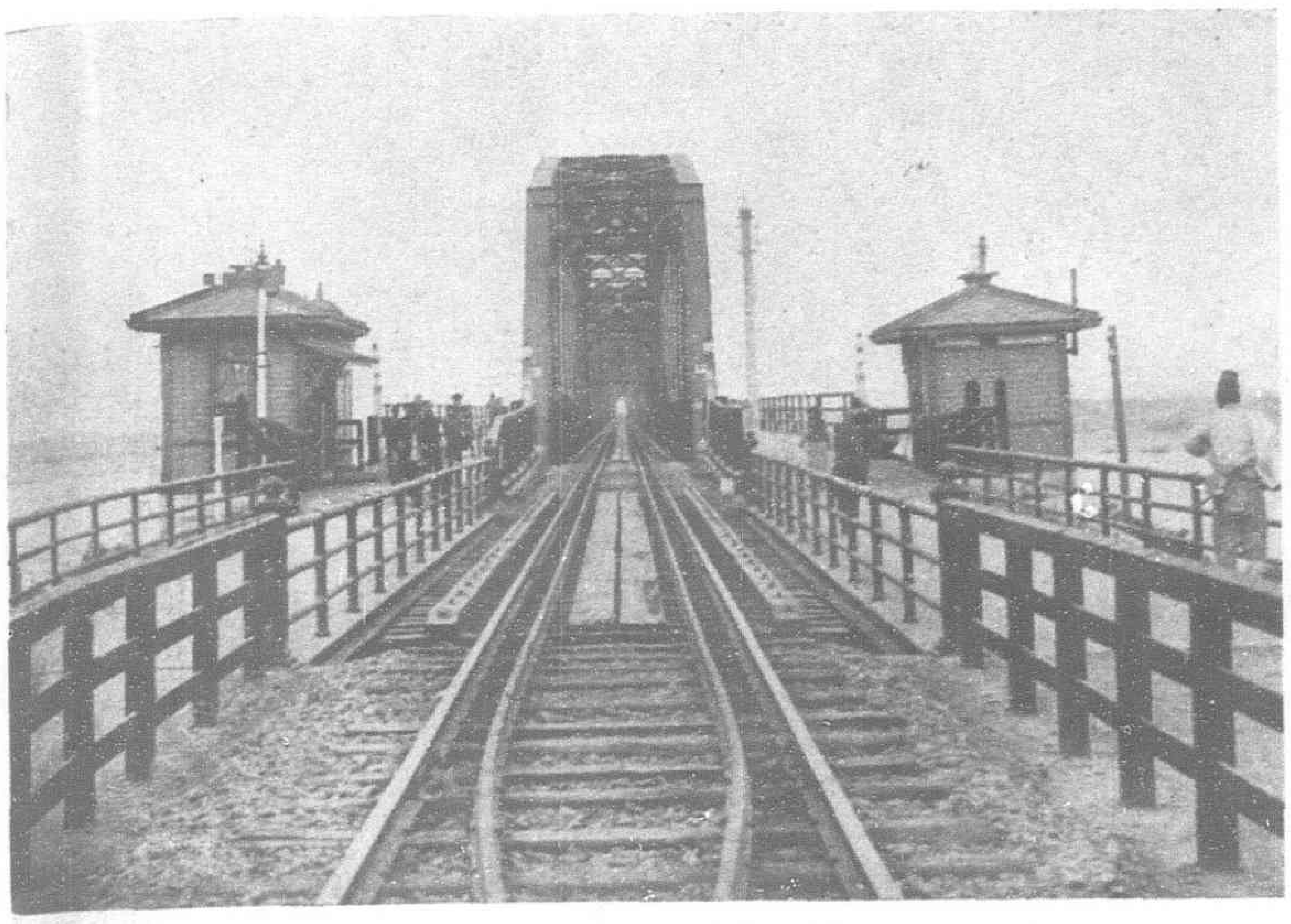


The "Keifuku Maru." Modern steamers of this type make the eight-hour run twice daily between Shimonoseki and Fusan

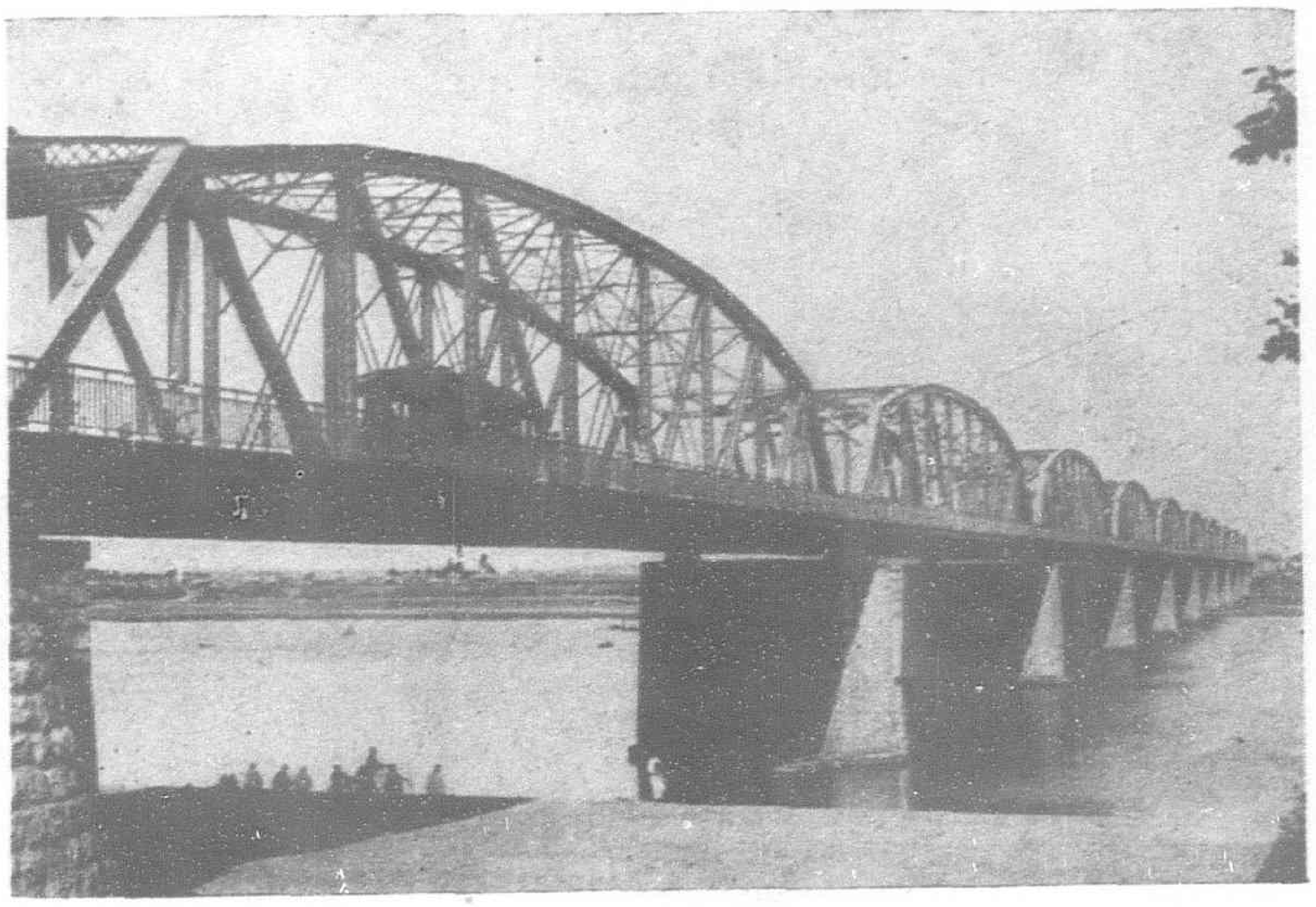
Principal Navigable Rivers

The Yalu (Oryoko) river forming the boundary between Chosen and Manchoukuo rises from Paktusan (the "Ever-white" Mountains 9,000-ft.) and empties into the Yellow Sea. The whole length is about eight hundred kilos of which seven hundred kilos, that is, from the mouth to Shinkapachin, is navigable by air-propeller boats under Government subsidy, besides junks and other sailing boats. Its upper course traverses a vast virgin forest region. Timber felled there is made into rafts and floated down its many rapids until it reaches the lumber-yards at Shingishu or Antung.

The Daido river flows past Heijo and empties into Yellow Sea near Chinnampo. It



Bridge over the Yalu River



Iron Bridge over the Daido

is four hundred kilos long and has a navigable course of 245 kilos. Steamships of two thousand tons can sail up the river as far as Hosanpo, sixty-three kilos from the mouth.

The following important rivers are open to navigation by sailing and motorboats.

River		*Navigable course*
Rakuto	(flowing into Chosen Channel near Fusan) ..	.. 344 kilos
Kanko	(,, ,, Yellow Sea through Keijo) ..	.. 300 ,,
Kinko	(,, ,, ,, ,, at Kunsan) ..	.. 130 ,,
Tumen	(,, ,, Sea of Japan in extreme N.E.) ..	.. 85 ,,

Airways

The development of air traffic in Chosen has naturally been stimulated by the tremendous development of this business in recent years both in the mother country and foreign countries. Business men have therefore developed air traffic and trained crews with noteworthy results.

Private Airway business—The Japan Air Transport Company, founded by a subsidy from the home Government in October, 1928, opened its regular air-routes between Tokyo and Dairen via Chosen on April 1, 1929, and now makes six return flights per week for mail-matters, freight and passengers.

Besides the business flights above mentioned, pleasure flights are made by the observation planes of the same company over Keijo and Urusan, ten and five days a year respectively.

Up to the end of March, 1931, the statistics of air transport were as follows:

The Japan Air Transport Company,	Branch Office ..	.. 1
,,	Substation	.. 3
,,	Business Office ..	.. 1
Air Transport Business Company	.. ..	.. 1

The following table shows the number of passengers and quantity of goods carried to and from Chosen by the aeroplanes of the Japan Air Transport Co., in 1931.

	Passengers	*Mail Correspondence*	*Parcel Post*	*Freight (Kilogram)*
Departures .	1,508	29,269	244	3,621.99
Arrivals ..	1,493	31,322	673	6,307.53
Total ..	3,001	60,591	917	9,929.52

Air Routes—It is obvious that the development of air traffic is of tremendous importance to transportation, communication and national defence. In order to develop this traffic, it is most necessary to open air routes. Therefore, the Communication Bureau of the Government-General, in accordance with the plan of the Communication Department in Tokyo, has already formed a plan to develop a trunk air route between Tokyo and Dairen via Chosen, and in 1928, three airports were established, one in Urusan, one in Keijo and one in Heijo; eight ground marks were set up in Urusan, Kwokan, Taiden, Tenan, Shariin, Heijo, Teishu and Shingishu.*

There are now two wireless stations, one in Urusan and another in Keijo to make connection for airway news, and also a meteorological observatory (branch office) at the airport in Urusan, for the forecasting of weather conditions. At each airport there are officials for customs examination and also for general supervision.

Chosen has now become one of the international airway centers of the Far East. Since the opening of the airports in Chosen many distinguished foreign flyers have visited this part of the world, and this, no doubt, is a good step toward international amity.

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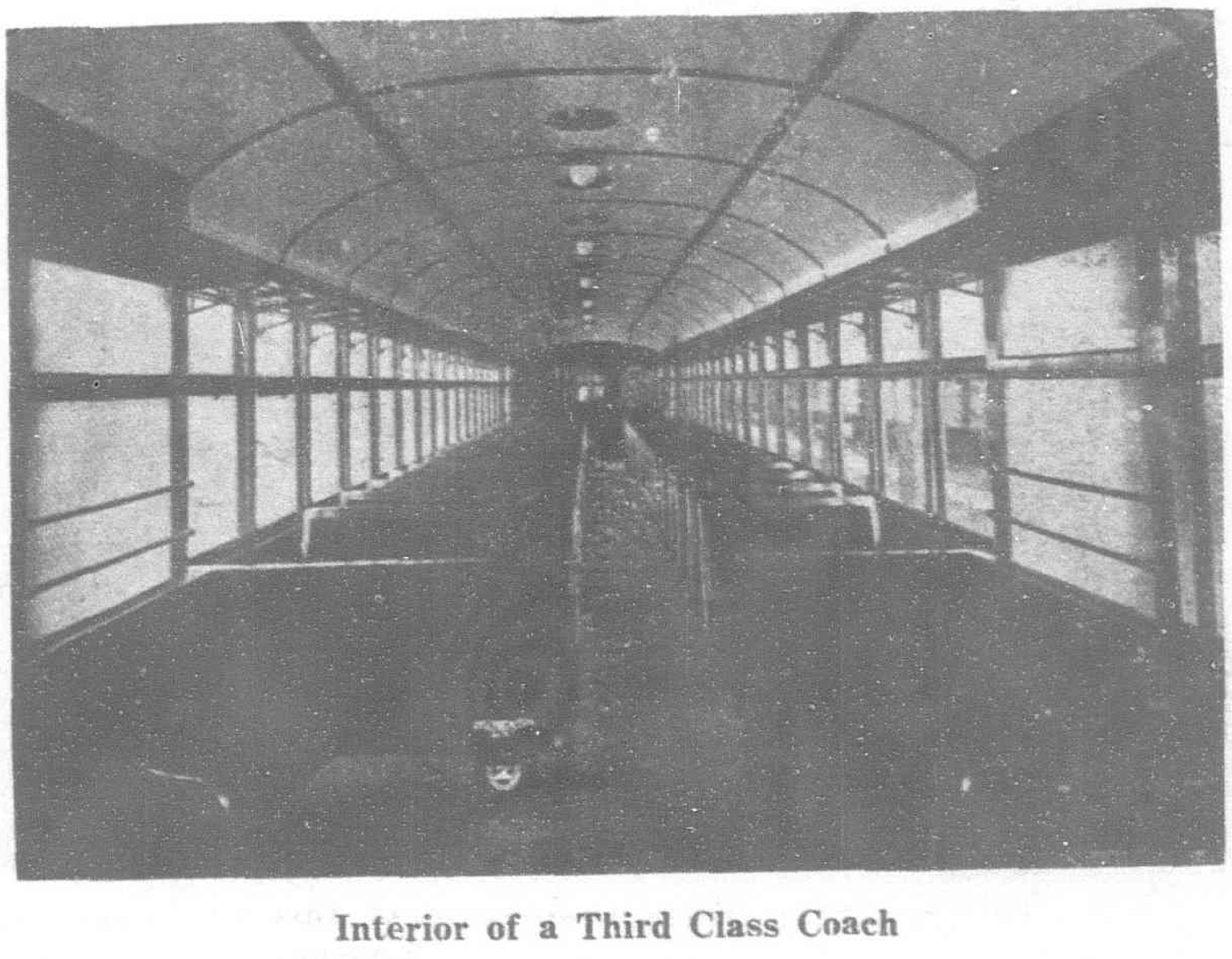
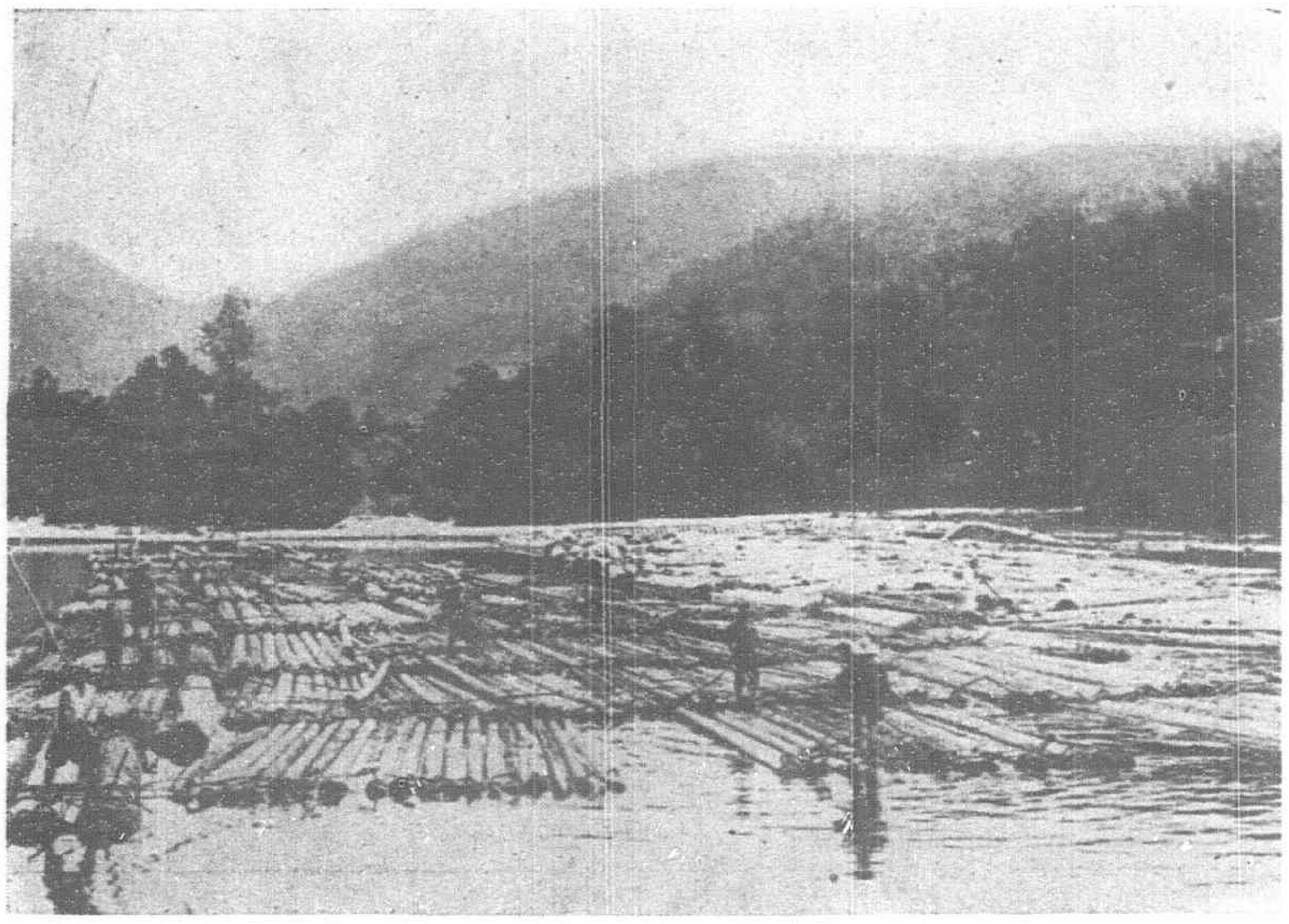
* A temporary airport was established in Shingishu on December 28, 1931.

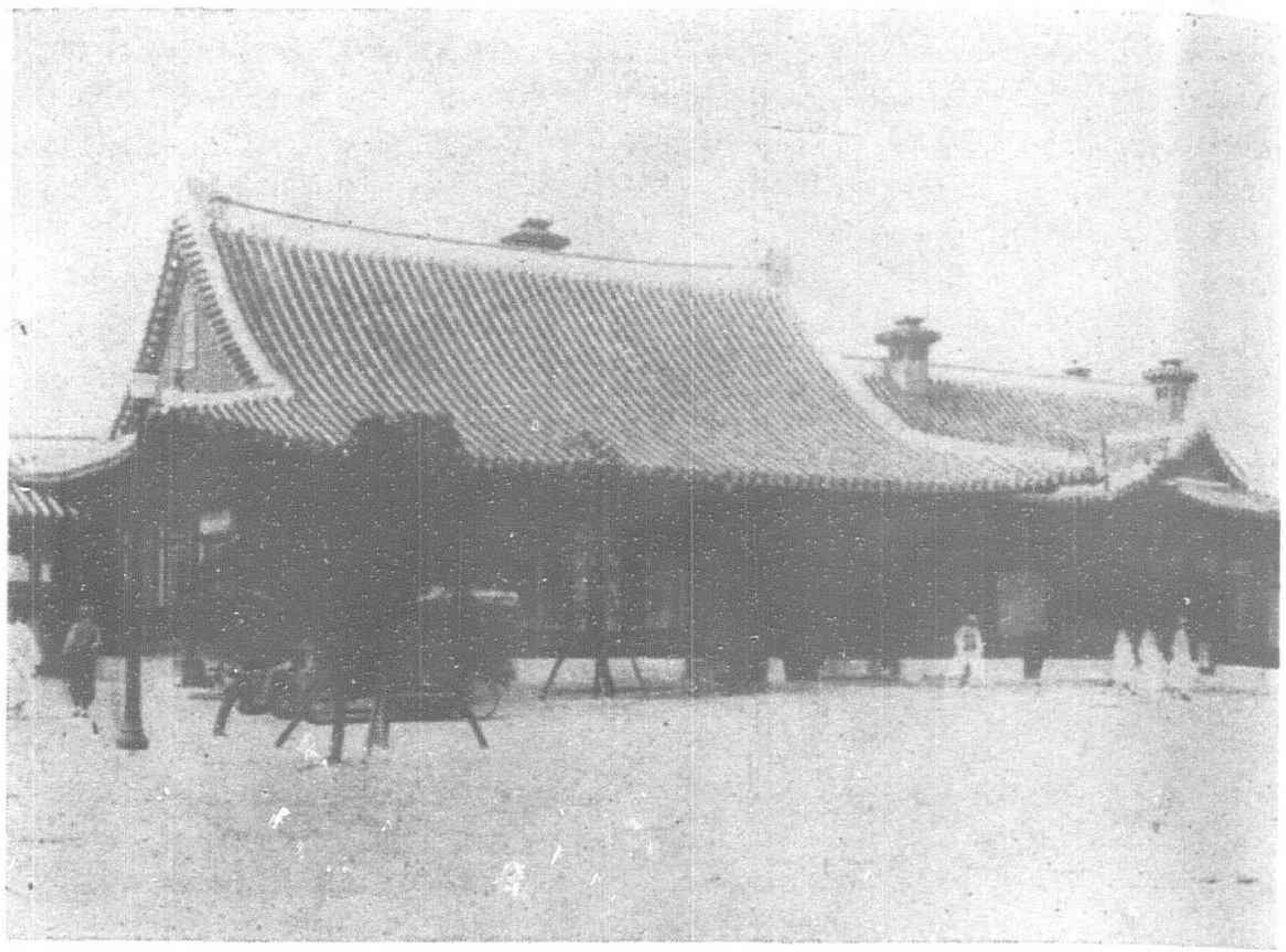
Dining-car attached to Express Train



Interior of a Third Class Coach



Lumber Rafts from Virgin Forests of the Upper Yalu



Korean Style Station Building at Suigen

Posts, Telegraphs and Telephones

A Japanese postal service in the peninsula was begun with the establishment of a post-office at Fusan in 1876, when the port was opened to foreign trade, followed later by the opening of similar offices in other treaty ports with the increase of Japanese settlers. In 1896 the Korean Government introduced a modern postal system, modelling it on that of Japan, and in 1900 formally joined the Universal Postal Union, but owing to poor management and consequent financial loss it was placed under Japanese control in July, 1905, and the Japanese postal system was made common to the two lands. Before 1905 there were 427 Korean and 89 Japanese offices as organs for communication, but to-day they number 781, including 114 telegraph and telephone offices, employing 14,085 men in all of whom 6,687 are Koreans and two foreigners. To facilitate postal services in the country an Employees Training School was founded in 1907, and up to March, 1932, this school had sent out 3,450 graduates of whom 960 are Koreans.

The beginning of the telegraph service was in 1884 when a Japanese office was created in Fusan for communication with the homeland. Later on, similar offices were established in Keijo and a few other centers. The submarine cable between Fusan and Japan was originally the property of a foreign company, and its management was carried on with few exceptions under the Universal Telegraph Rules, but in 1910 Japan bought the cable from the company for the greater benefit of the public. Each year increase was made in the number of operating offices, and from only 44 in 1905 they rose to 789 in 1930.

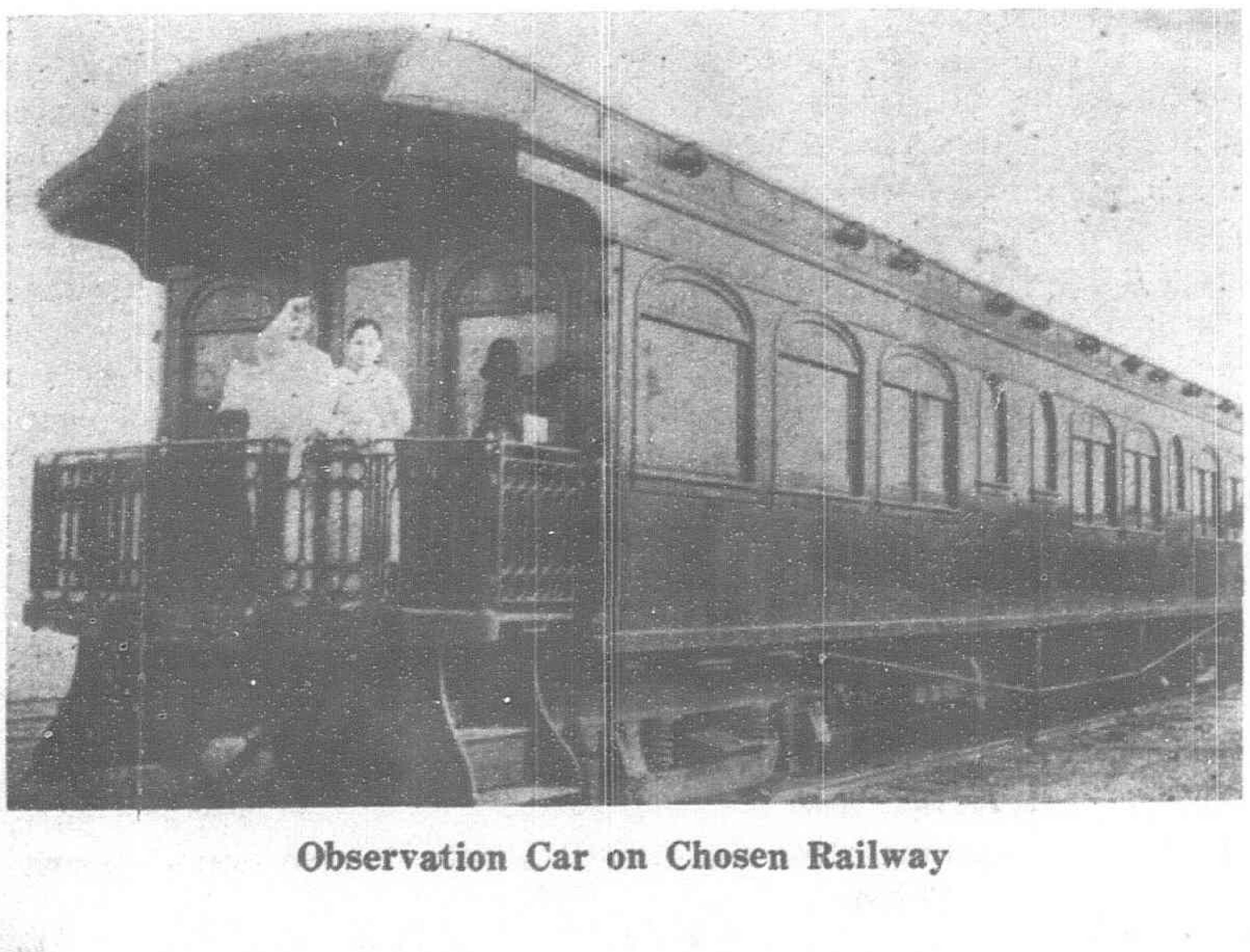
In 1910 a wireless apparatus was installed on the *Kosai Maru*, an official inspecting steamer, and in the three lighthouses on the west coast, though the service has not yet been thrown open to the public, and in 1923 a wireless office was opened in Keijo to handle messages sent to and from ships sailing in Korean waters and those of the general public. Later on more wireless stations were established in Mokpo, Saishu (Quelpart), Fusan, Chinnampo, Seishin and in Urusan.

The first telephone service was undertaken in 1902 between Keijo and Jinsen, and subscribers numbered only 65. In 1903 an exchange service at Fusan was started, and the number of subscribers increased from 310 at the end of that year to over 1,000 at the time of the postal union with Japan (1905). At that time only 16 lines were in operation, but expansion was rapidly pursued, and a long-distance line between Keijo and Heijo was opened in 1907, and one between Keijo and Fusan in 1911. Also in 1921 direct connection between Keijo and Mokpo, and Keijo and Gensan was effected, and the 828 lines in operation in 1911 were increased to the large number of 8,408 in 1930 inclusive of 220 long-distance ones. In November, 1926, a Radio Broadcasting office was established in Keijo and opened to business in February, 1927, subscribers numbering some 2,000 at first but now 14,309. In the following table certain details are given of the telephone service.

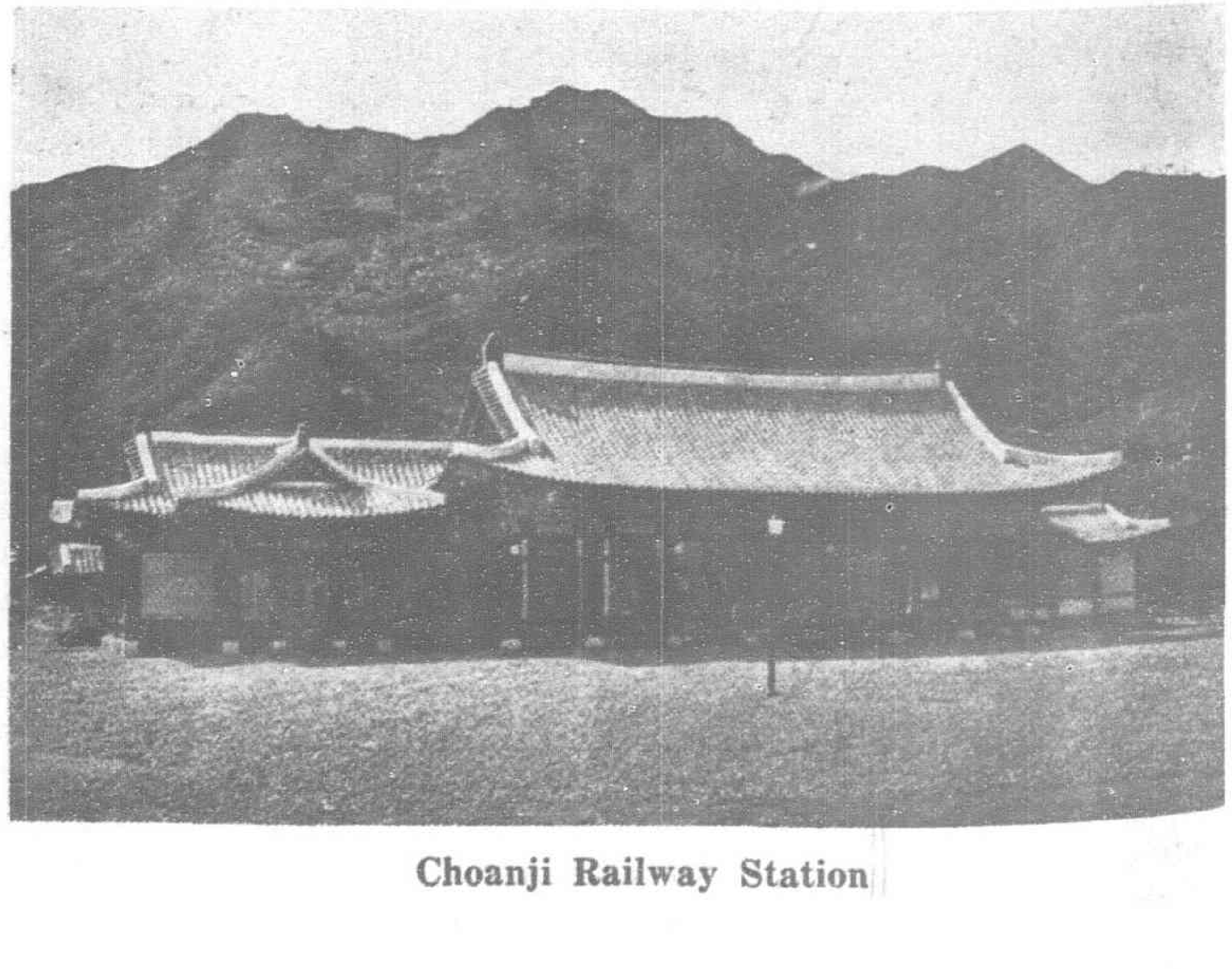
Year	*Telephone offices*	*Telephone subscribers*	*Calls during the year*
1905..	6	1,065	8,489,530
1910..	217	6,448	21,260,613
1920..	529	13,142	59,974,020
1925..	610	26,265	114,510,002
1930..	681	32,664	176,455,929

Electric and Gas Undertakings

The first electric enterprise in Chosen was the building of a tramway in Keijo by a joint-stock company organized by an American citizen in 1899, and in 1901 it started the supply of light in addition. Similar works were started in Fusan in 1902 and in Jinsen in 1906, after which little progress was made, for at the



Observation Car on Chosen Railway



Choanji Railway Station

time of union with Japan they still numbered but three with an aggregate capital of Y.3,000,000 and a capacity of 1,300 kilowatts. Since that year, however, steady growth has been witnessed in meeting the general increase in demand for electricity, and these undertakings in 1931 numbered 92 in operation with a total capital of Y.222,000,000 and a capacity of 461,000 kilowatts. Besides, there were 16 official undertakings for government use and 104 for domestic use.

In 1911 the Government began to make a country-wide investigation of the water-power that might be utilized for generating electricity, and completed it with respect to eleven of the larger rivers in 1914, but as the feasibility of hydro-electric enterprises can be determined only after making long and close inquiry, a more detailed investigation was started in 1922, and the result so far obtained is that 147 sites of promise, with a combined capacity of 2,228,199 kw. are ascertained to be capable of easy and profitable management. At the present time there are eighteen water power plants in Chosen with twelve already in actual operation.

There are two gas-producing undertakings in Chosen, one at Keijo and the other at Fusan. The former started work in 1909 and the latter in 1915, and the year 1931 saw their capital standing at Y.21,000,000 and their productive capacity at 6,370,000 cubic meters a year.

Control of gas was formerly exercised by the police authorities, but, in view of the fact that the business is done as a side line by electric companies, it was transferred in 1919 to the Communications Bureau so that both might be under the same supervision.

Historical Sketch of Government Railway Bridges in Japan Proper

(Continued from page 315)

that in the latter the upper chords I-II, II-III, III-IV, etc. are not made in a straight line, but the panel points I,a, II,b, III,c and IV are made virtually along the line of a parabola.

The sub-verticals in type (*d*) must be of channel shape or of some other similar shape having a wide radius of gyration. This is because it is necessary for them to function as compression members and to prevent buckling of the upper chords, although the stress upon them is extremely small. In type (*e*), however, the sub-verticals act as pure tension members and can, even with their slender sectional area, fulfil their purpose. This fact naturally saves considerable extra cost. Moreover, type (*e*) is decidedly preferable from an aesthetic standpoint.

Along with the foregoing improvements effected in bridge construction and the principal features of truss bridges, rapid progress has been made in many other points of minor significance in building Japanese railway bridges and trestles. A striking contrast may be seen between bridges of more or less recent construction and those built during the early years of railroad construction in Japan proper.

The Nanking-Pukow Train Ferry

(Continued from page 318)

hull is exceptionally well subdivided by watertight bulkheads extending to the height of the upper deck.

Feed water is carried in a cellular double-bottom tank under the engines, and open floors are fitted elsewhere. The forward and after peaks are arranged for water ballast, and in addition there are deep tanks for trimming both forward and aft, and heeling tanks on the port and starboard sides.

Substantial wood fenders are fitted at the level of the upper deck, and similar fenders are carried round the bow and stern.

The navigating bridge is mounted at a level giving a commanding view above the trains, and extends the full width of the ship, and the captain's accommodation is fitted on this bridge. The accommodation for the officers, engineers and crew is arranged on a steel lower deck or flat aft of the engine room. A shelter is provided on the lower deck forward for passengers' use.

The deck machinery includes steam steering gears of the Wilson Pirrie type both forward and aft, both gears controlled by telemotor from the navigating bridge; two steam capstan windlasses forward; two warping capstans aft; steam driven traversing gear, electric lighting throughout the ship, including flood lights for the car deck, and steam heating throughout the living accommodation.

The twin-screw propelling engines are of the three cylinder, triple expansion, surface condensing type, with independent air, circulating, feed and bilge pumps, together with the usual ballast, general service, and other auxiliaries. Steam will be supplied by two single-ended Scotch boilers, will Howden's system of forced draught. The boilers will be arranged in separate stokeholds, one port and one starboard, with independent upstakes and funnels, so arranged in order that the center of the deck may be clear for the three lines of car track.

Chinese Power Plants Total 665

For about forty years electric power has been employed in China for various purposes, but comprehensive statistics relating thereto were lacking until recently Mr. Yun Chen, an expert of the National Reconstruction Commission and concurrently Chairman of the National Electricity Commission, made a general systematic survey of the power-plants in China.

The plants now operating in various parts of the Republic number 665, with a total capacity of 833,645 kilowatts. Of these plants 519 are erected for the purpose of supplying public consumers with electricity, and have a capacity of 558,270 kilowatts, while the remaining 146 have been built by factories and mines for their own use, the capacity of these plants being 335,375 kilowatts. In other words, 78 per cent of the total number of power-plants having 62.5 per cent of the total capacity, are public utilities supplying power, and 22 per cent of the number, with 37.5 per cent of capacity, are plants for producing power for private use.

In regard to the distribution of these undertakings, Kiangsu heads the list with 154 plants, Chekiang coming second and Kwangtung third, the largest aggregate capacity being also credited to Kiangsu.

Among the plants erected for public supply purposes 91 per cent are operated by Chinese private enterprise, 5 per cent by the Government, and the remaining 4 are concerns promoted by foreign investors. Regarding capacity, the first group produces 35 per cent of the total output of power and the Government concerns 13.9, while the foreign enterprises produce the largest share of the output, 51.1 per cent with the Shanghai Power Company the biggest individual concern, with a capacity of 161,000 kilowatts and a capital of $116,000,000.

Although among the electric plants for private supply the Chinese-owned (88.4 per cent) greatly outnumber the foreign plants (11.6 per cent), their respective capacities are in the proportion of 53.3 to 46.7, an excess of 6.6 per cent only in favor of the Chinese concerns. Moreover, some of the Chinese-owned plants, like the Kailan Mining Co., also utilize foreign capital, so that the capacity of the exclusively Chinese-owned concerns is actually less than the 53.3 per cent mentioned.

Under the regulations governing electrical enterprises, plants are classified in four grades, those having a capacity above 10,000 kw. being in the first grade, those with a capacity of from 1,000 to 9,999 kw. constitute the second grade, from 100 to 999 kw. the third grade, and from 1 to 99 kw. the fourth grade. Of the 519 power-supplying plants five belong to the first grade, 34 to the second, 105 to the third, and 293 to the fourth, with the standing of the remainder unknown.

Among the 519 plants the capacity of 402, amounting to 506,600 kw. can be estimated with certainty. The total capital of $303,377,140 invested in these plants indicates that each kilowatt is capitalized at an average of $600. According to rating first grade plants are financed at $621 per kilowatt, second grade at $645, third grade at $663, and fourth grade at $845. In accordance with the principles of engineering the best-equipped plants return the least average expense, but the non-proportion between the first and third grade plants is caused by the fact that the former are all erected in great industrial and commercial centers, where land is expensive and values are high all round.

In the power-plants for private use the most accurate estimate of the capacity of 37 is 35,308 kw., the plants costing $9,340,273, with an average of $625 per kw., the small equipment of the latter plants accounting for the great difference in the average capitalization of public utility and private plants.

Taken as a whole, the 519 public supply plants are financed at about $336,000,000 and the 146 private plants at approximately $86,000,000 making a total sum of $412,000,000 invested in power-production in China.

Engineering Notes

INDUSTRIAL

CANNING.—Sardine fishing companies in the Japanese half of Saghalien have decided to establish the Karafuto Joint Fishery Company with a capital of Y.5,000.000.

NEW FLOUR MILL.—The Masuda Wheat Flour Mills Company of Kobe has decided to build a new mill at Koyasu in Kanagawa Prefecture. The new mill will have a daily capacity of 500 barrels, and is expected to be completed in August. The site covers 3,000 tsubo.

SPINNING MILL FOR TSINGTAO.—A spinning company is to be organized in Tsingtao by the Toyoda Spinning Company, Shanghai, and the Nikkwa Silk Company in Shantung, associated with the Katakura Silk Reeling Company. The proposed concern will be capitalized at Y.3,000,000.

MANCHURIAN FORESTS—Mr. Fusajiro Abe, president of the Toyo Spinning Company of Japan, has decided to get into Manchurian forest development. His plan includes a large pulp company under joing Japan-Chinese management. The Oji Paper Company and rayon companies would be asked to take shares.

ARMAMENT DEPOT FOR HONGKONG.—Hongkong arsenal yard having been surrendered to the Colonial Government, a new armament depot is being provided at Stonecutters Island at a cost of £175,000, of which £40,000 is set down in this year's naval estimates. Similarly, in lieu of the existing hospital buildings, which are to be purchased by the Colonial Government, to which the site belongs, a new naval hospital is being erected at an estimated cost of £132,000, though only £8,735 toward it is yet voted.

AVIATION

SINGAPORE AIRPORT—Singapore is to have a thoroughly modern airport which will be one of the most costly in the world. It will cost $3,500,000, will take more than four years to build *and some 8,000,000 tons of earth* will have to be filled in on the site which, at present, is a swamp.

PLANES FOR CHINA—A campaign to raise $2,000,000 for the purchase of 150 aeroplanes for the Government will be launched to-day by the China National Aviation Association, and is to last two months. More than 200 prominent merchants, residents and bankers are busily organizing teams to canvass for new members for the Association. The membership fees derived from them will all be deposited in Chinese banks until the conclusion of the campaign.

SHANGHAI-TIENTSIN AIRWAY.—It is announced that formal inauguration of the Shanghai-Tientsin *Airway, to be operated by* the China National Aviation Corporation, will take place on New Year's Day. Many difficulties were encountered in connection with landing fields and other facilities, but these have been overcome. The Corporation has succeeded in acquiring a lease of the Tsingtao landing-field by payment of $20,000 to the Japanese lessees. Upon inauguration of the service planes will take off from each terminal three times a week, carrying *passengers and mails. The tentative schedule is* as follows : Leave Shanghai, 7.45 a.m. ; Haichow, 10.55 a.m. ; Tsingtao, 12.30 p.m. ; arrive Tientsin, 3.30 p.m. Leave Tientsin, 8 a.m. ; Tsingtao, 11.15 a.m. ; Haichow, 12.45 p.m. ; arrive Shanghai, 3.45 p.m. The journey will be accomplished in about seven and a half hours. covering a distance of approximately 690 miles, and the trip will cost $120.

COMMUNICATIONS

CHINA : DIRECT WIRELESS.—Negotiations have been concluded for a direct wireless service between London and Shanghai, which, it *is hoped, will be in operation towards the end* of this summer. The Shanghai installation, which is being supplied by Great Britain, will be financed from the proceeds of the Boxer Indemnity Fund, and it is believed that the first portion of the machinery is already on its way to China.

BOXER FUND LOANS.—The Board of Trustees of the Sino-British Indemnity Fund decided to advance £4,500,000 to the Ministry of Railways for the construction of the Canton-Hankow Railway, and £360,000 to the China Merchants Steamship Company to have six ships built in Britain. These two loans, which represent approximately $80,000,000, will be the biggest advance ever made to the Chinese authorities by the Board, which is also considering favorably further loans for educational and communication purposes.

CHRISTMAS ISLAND WIRELESS.—The Christmas Island Phosphate Company has for some time past maintained a small wireless station, which is being extended and modernized *by the provision of two Marconi stations for* direct communication with Singapore and with distant ships. The link with Singapore is by short-wave, utilizing a "Type S250" transmitter covering the waveband of 20 to 100 meters, with a power to the aerial of 250-W when operating continuous wave telegraphy, for which it is particularly designed. For working with ships on medium wavelengths, a special 200-W transmitter has been supplied. Christmas Island is 800 miles south of Singapore in the Indian Ocean.

MINING

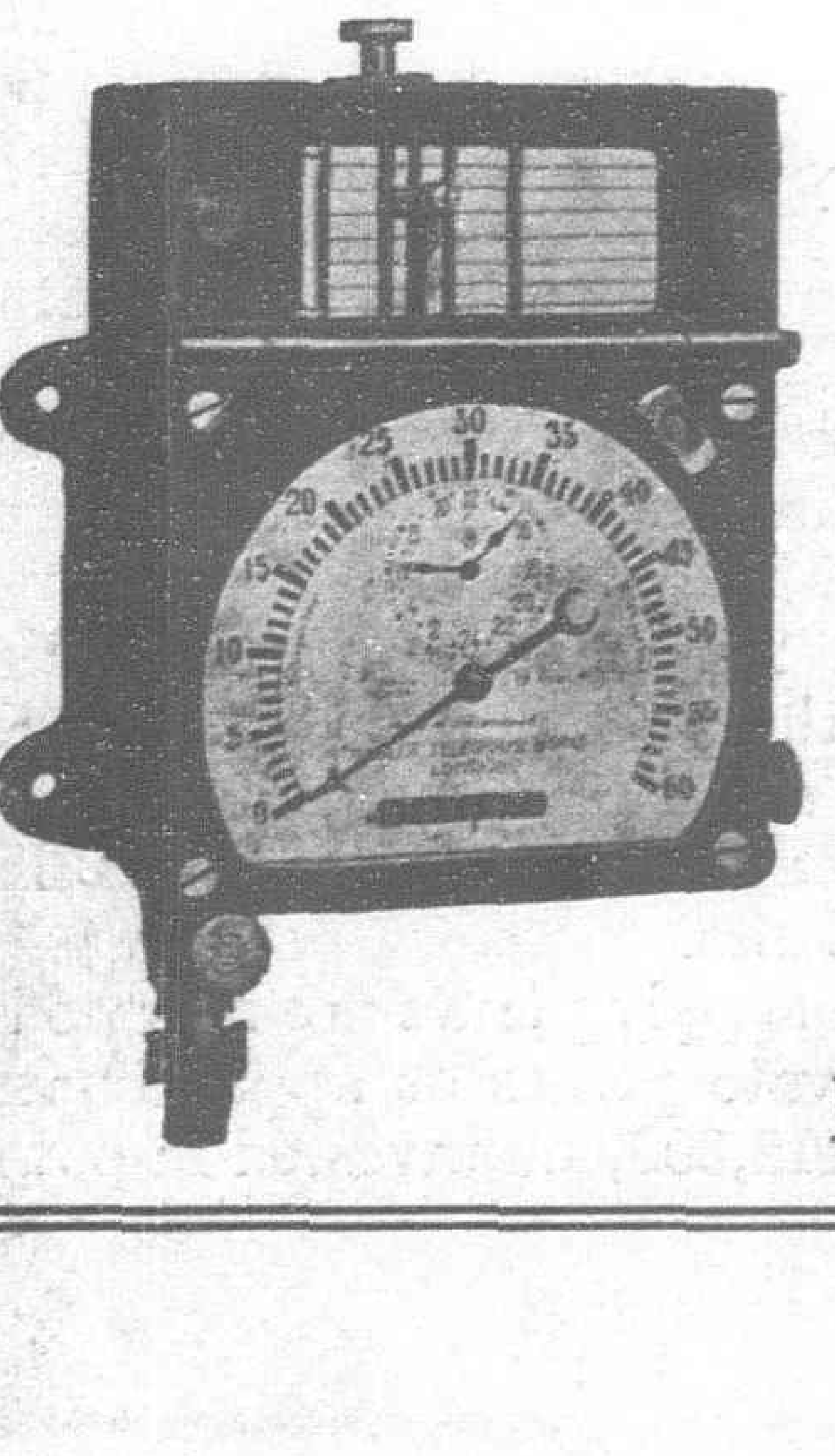
FORMOSAN GOLD.—The Mitsubishi Mining Company, largest gold producer in Japan, is to undertake placer gold development at Tatsukiri River ravine in eastern Formosa at the invitation of the Formosan Government-General. The property is rather inaccessible and will call for heavy capital outlays on communications. The Government-General, it is reported, picked Mitsubishi because of its financial resources and its experience of placer mining in Kintei, Korea. *For some months Mitsubishi* engineers have been surveying the Tatsukiri property. Technically the enterprise is difficult because of immense stones in the river bed and the fact that the river is in a district peopled by head hunters.

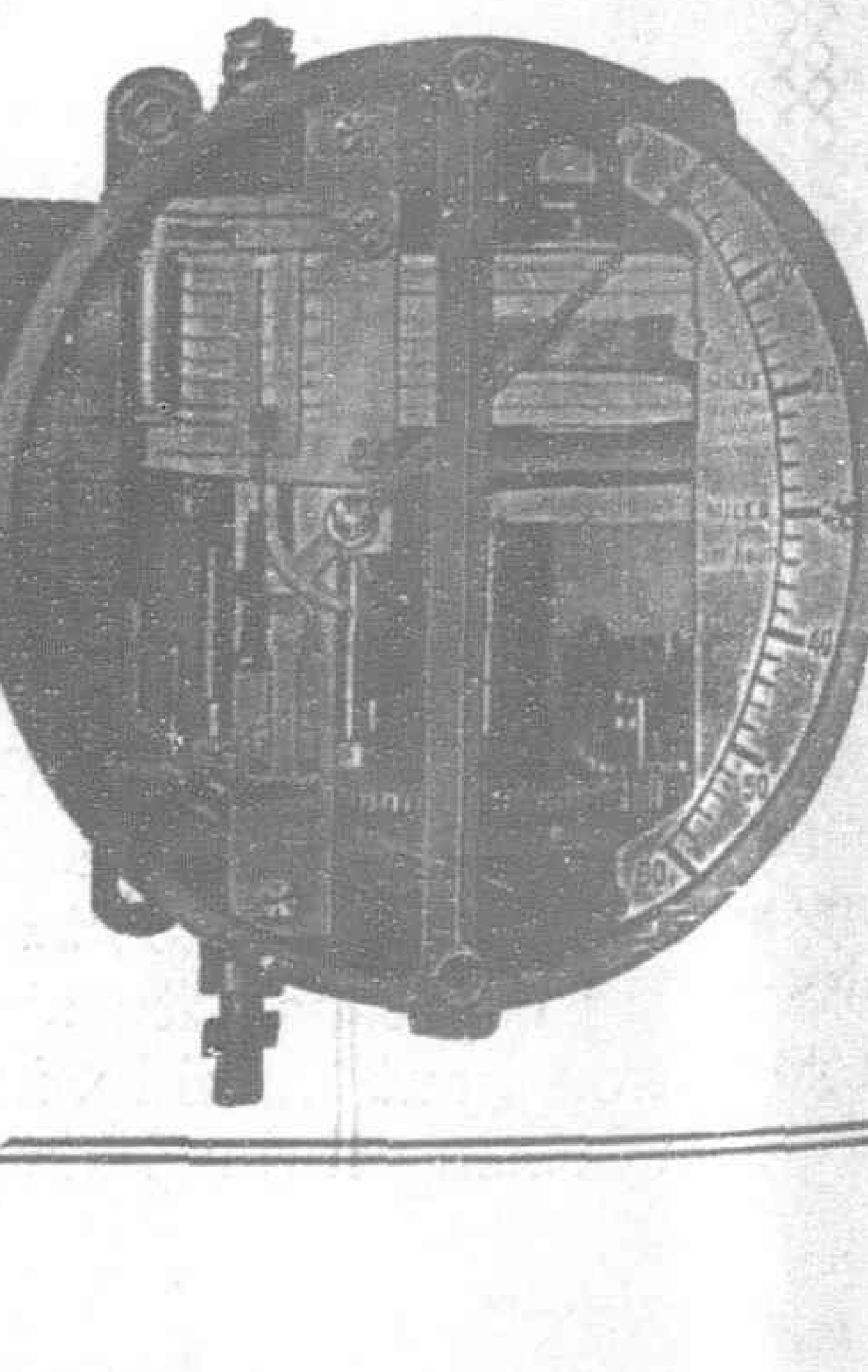
COAL MINING IN FUKIEN.—Prominent Chinese are promoting a mining corporation with two million dollars capital, for developing the *Fukien's rich coal deposits.* While prospecting for tin at Yungchun they discovered in the Tienhushan mountains a very promising coal deposit, estimated to contain 1,800,000,000 tons of high-grade anthracite. Another promising coal field west of the Tienhushan Mountains, also high-grade anthracite, has yet to the investigated. The problem of transport from this mountainous area has been studied. Connection between Yungchun and Anki, and between the Tienhushan *Mountains and Hutou, in each case* a distance of 20 *li*, may be effected by light railroads. From Hutou coal can be transported by water. It is estimated that the railroad, together with rolling stock and a 5 ton locomotive, would cost approximately $200,000. The cost of a steamer with a fleet of lighters is estimated at $200,000.

ELECTRICAL

POWER STATION SCHEME.—The Naragagawa Electric-Chemical Company, affiliated with the Toho Electic Power Company of Japan, has decided to erect a power station at Uchigaya on the Nagara River. The proposed station will generate 40,000 kw. Expenses for the station are estimated at Y.4,600,000, inclusive of transmission lines. Work is expected to start in *September this year to be finished in two* full years.

KOREAN HYDRO-ELECTRIC DEVELOPMENT.—Thirty-five applications have been received by the Korean Government for permission to establish hydro-electric undertakings in Korea. The most important are those of the Korean Electric Industrial Co. (capital £3,000,000), the Korean Electric Power Co. (£5,000,000), the Korean Nitrogonous Manure Co. (£5,000,000), the Seoul Electric Co. (£1,900,000), the Korean Railway Co. (£1,720,000), and the Korean Central Hydro-Electric Co. (£1,000,000).





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INDICATES :—Speed.
Total mileage since application of Instrument.
Total mileage of each run.
Time of Day in Hours and Minutes.
RECORDS BY SILVER STYLUS :—Speed attained at any point of run.
Time the engine or coach is at work.
Distance covered.
Duration (up to 24 hours) and point of stops.
Time of Day in Hours and Minutes.
If desired apparatus to record working of Westinghouse or Vacuum Brakes.

HASLER TYPE

Chart Feed on a Time Basis of 4 m/m per Minute.

INDICATES :—Speed.
RECORDS BY NEEDLE PUNCTURES :—Speed attained at any point of the run.
Time the engine or coach is at work.
Distance covered.
Duration and point of stops.
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